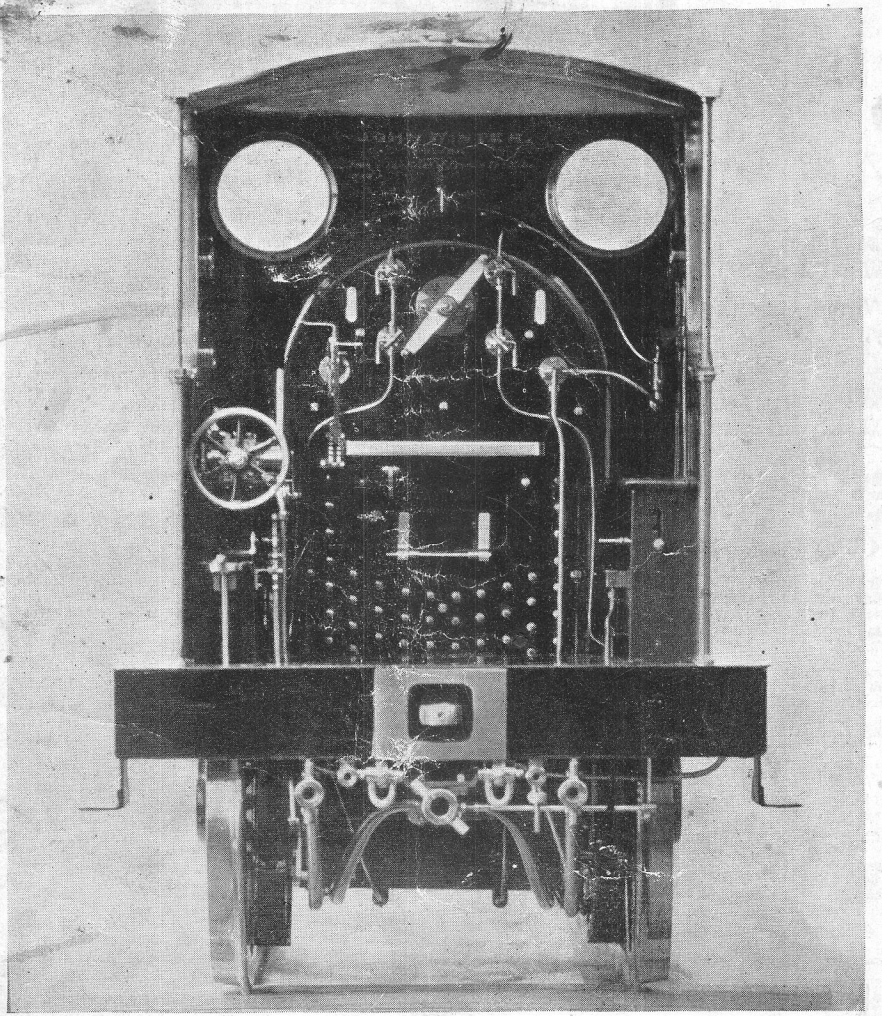
THE MODEL ENGINEER

Vol. 94 No. 2344 THURSDAY APRIL 11 1946 6d



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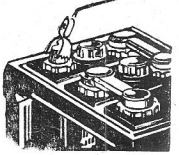

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THE MODEL ENGINEER

APRIL 11th, 1946
VOL. 94. No. 2344

Smoke Rings

Left-handed Mechanics

QUITE as a matter of idle curiosity I wonder if any of my readers are, or if they know of, mechanics who are left-handed in the workshop. We all know people who are left-handed in the ordinary affairs of life, or in playing games, but I do not remember seeing a left-handed craftsman at work. We do, of course, use both hands in many workshop operations, but I do not think I have ever seen a hammer and chisel, or a file, or a hacksaw used in a left-handed fashion. When you use a spanner you naturally take it in the right hand without thinking. The majority of machine tools are equally usable by either left-handed or right-handed workers, but has it ever occurred to you that the lathe is designed as a right-handed tool? If you consider the movements required in operating a lathe you will realise that the right hand is used much more than the left. A lathe designed for the incurable left-hander would have the mandrel headstock at the right-hand end of the bed, the poppet head would be at the left, and the slide-rest would be operated from the near side accordingly. This is rather a fantastic conception I admit, and I doubt if a left-handed lathe has ever been built.

The Danish Model Railway Club

I AM indebted to Mr. A. Lyngkilde, of Helsingor, for an interesting story of the doings of the Danish Model Railway Club, which now has 150 members and an excellent club lay-out in the Norrebro Station of the Danish State Railways. I wonder when we shall find a British railway company offering similar hospitality to a model railway club in the home country. The lay-out, according to a blue-print before me, has a continuous double track in "O" gauge with a branch line leading to a 3-platform terminal station. It can be operated automatically from two central switch-boards with press-buttons. The locomotives and rolling stock built by the members are of very good quality, but, so far, Mr. Lyngkilde is the only possessor of a steam locomotive, the "Bat," which can be regarded as a success. He tells me that another steam locomotive was built by a member, who, as a professional mechanic, embodied his own ideas as to design and construction. He issued a challenge to the "Bat" and when the running started he said, "Listen—You can certainly hear my engine puff, but I can't hear yours." "Well," writes Mr. Lyngkilde, "he was right, but after one lap his engine hadn't any more breath, while the 'Bat' continued to run, and still will continue as long as there is any water in the boiler. The other engine has not yet been able to do more than one lap at a time." My correspondent has been asked by several of the members to build locomotives for them, both steam and electric, so he says he is likely to be kept busy for some time to come. He adds, "When building other 'O' gauge engines I can have a little fun for myself as I intend to build a coal-fired 4-6-0 engine in that gauge if I can manage to design and construct a suitable boiler. The fun will come, I think, when I try to provide this engine with an automatic firing system for obtaining long uninterrupted runs. They say it can't be made to work!" I wish him success in the interesting problem he has set himself.

Northern Heights Gala Day

IN pre-war days the annual Gala Day organised by the Northern Heights Model Flying Club was one of the most popular events in the model aviation calendar. I am glad to hear that this fixture is now being resumed and the 1946 outing will be held on Sunday, June 30th, at the Langley Aerodrome, near Slough, by permission of the Hawker Aircraft Co. Ltd. A series of attractive competition events will be staged and all visitors interested in model aviation will be made welcome. It is hoped that flying demonstrations by some of the latest full-size fighter aircraft may be included in the programme. Full information may be obtained from Mr. F. E. Wilson, 9, Dorset Drive, Edgware.

American Locomotive Driving Wheels

A NOTE from Rev. John D. Mahar, of St. Charles College, Maryland, U.S.A.:—"I was interested in the 'poke' our friend 'L.B.S.C.' took at the many designs of driving wheels used on our American railroads. From what I can gather, talking to some maintenance men and designers, these new designs have been long in coming and are the results of long research on all sides, from the designer to the testers, who worked in trying to produce a wheel that would not get out of round at high speeds. As usual, each company has its own pet design and many of these have been adopted by the model makers because they are much easier to machine than the multi-spoked wheels of other days."

Percival Marshall

BRISTOL MODEL CLUBS' EXHIBITION

DURING the fortnight, January 5th to 19th, the Bristol Art Gallery and Museum was the scene of an excellent exhibition of models and handicrafts. The organisation was the combined effort of the Bristol Society of Model and Experimental Engineers, the Bristol Ship Model Club, the Bristol Speed Boat Club, the Bristol Railway Circle, and the Bristol and West Model Aircraft Club, and an extremely comprehensive selection of exhibits was the result. The attendances each day clearly demonstrated the interest that had been aroused in the local public; very long queues of waiting visitors formed at frequent intervals, and we gathered the impression that many of the visitors had not previously seen an exhibition of this kind. Lack of space had imposed a restriction upon the number of items shown; but, none the less, there was plenty to see and to satisfy the most ardent enthusiast, as well as to astonish anyone who had not previously been initiated into the scope and meaning of our hobby. If there was anything lacking in the number of items, it was fully offset by their quality and variety; and, in any case, the hall was scarcely large enough to accommodate any more without overcrowding.

A group of model aeroplanes first attracted the attention upon entering the hall. It consisted of flying and non-flying planes, gliders and some excellent examples of uncovered framework. A complete "skeleton" plane fitted with an electric-motor "engine" so set that, at fairly long intervals it suddenly started working and then relapsed into motionlessness, caused amusement as well as attracting much attention to itself.

As might, perhaps, be expected, there was a brave show of ship models; they covered a very long period of shipbuilding, and a wide variety was represented. The general standard of workmanship was excellent, especially among the square-rigged sailing-ships; one of these, a small reproduction of the famous clipper, *Torrens*, was a particularly noteworthy piece of work, realistic to a degree. Power boats of several different types were to be seen in various stages of construction, and there were several petrol engines ready for fitting into hydroplanes and racing craft.

Railways and locomotives in miniature figured prominently, and they showed a marked preference for the G.W.R. and L.M.S.R. We were pleasantly surprised, however, by the presence of a fine L.N.W.R. "Precursor" 4-4-0 engine for 7¼-in. gauge, shown in course of construction. This engine was connected up to a supply of compressed

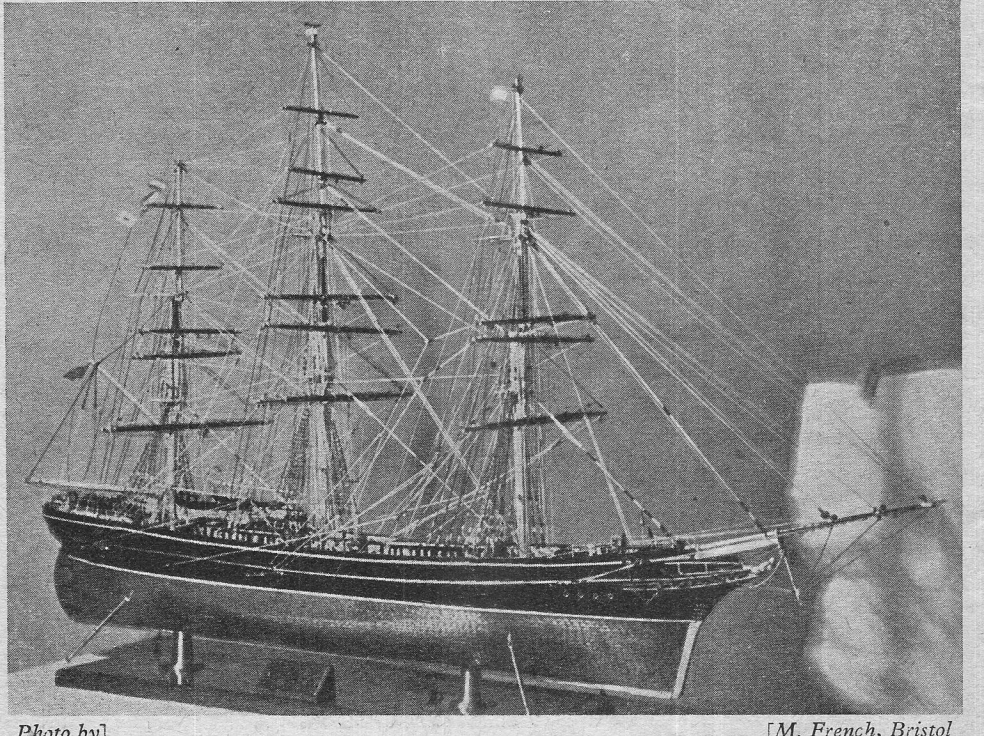


Photo by] [*M. French, Bristol*

A ¼-in. scale model of the "Cutty Sark" by A. Kirton

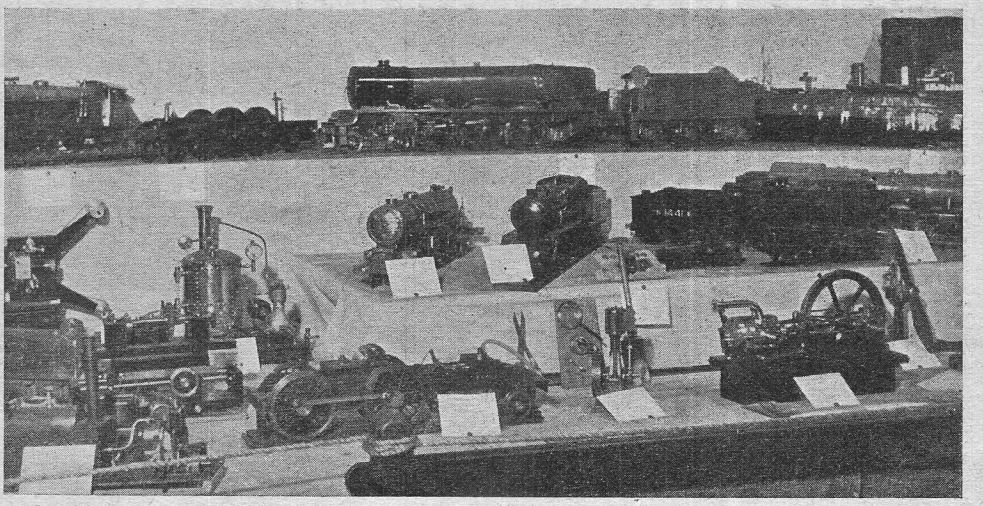


Photo by] [*H. A. Hibbs*

Part of the stand of the Bristol Society of Model Engineers

air, so that the coupled wheels and valve-gear could be seen working ; a mirror arranged below aided the inspection of the moving parts. A partly-finished ¾ in. scale L.M.S.R. "Princess Royal" 4-6-2 showed good work and excellent finish in all details, though we think that the shape of the chimney—always something of a difficulty!—might be improved.

A length of "O" gauge track, all along one stand, with a concealed loop at each end, was

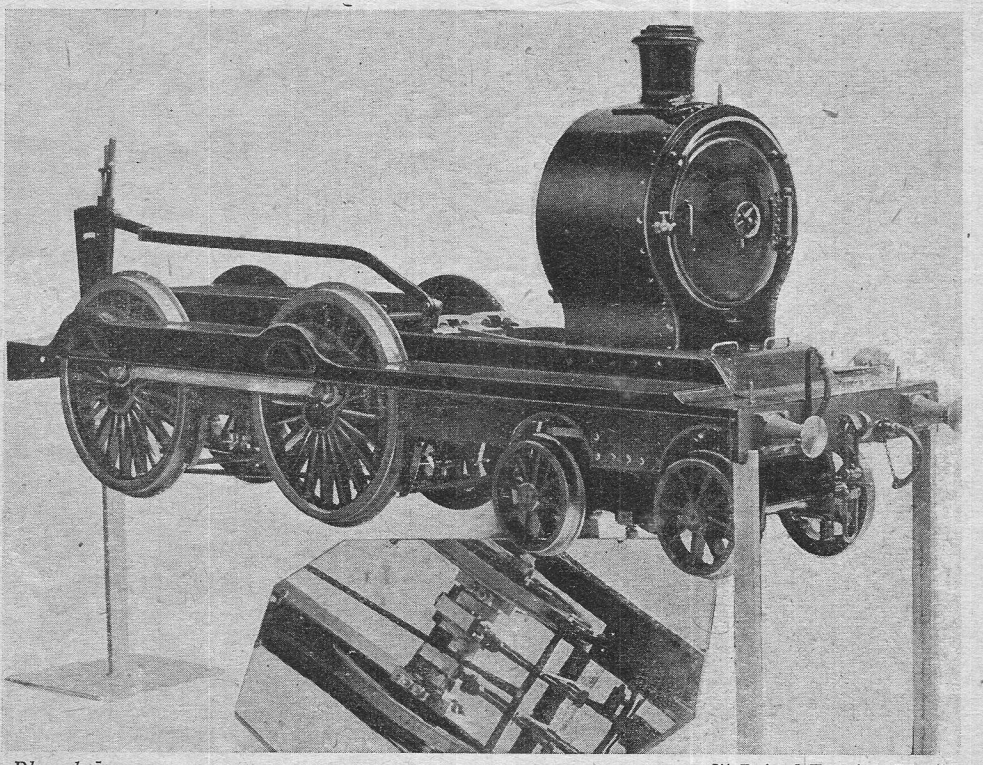


Photo by] ["*Bristol Evening Post*"

A 1½-in. scale L.N.W.R. "Precursor" begins to grow

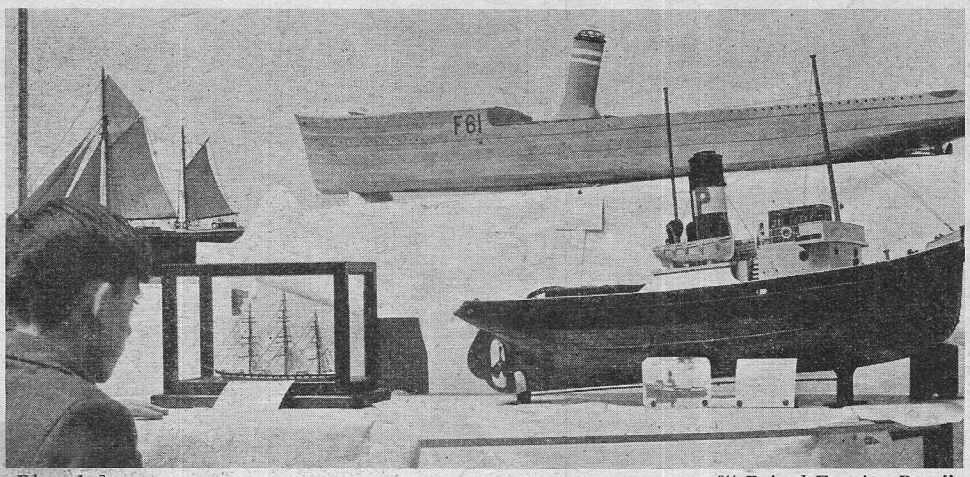


Photo by] [*" Bristol Evening Post "*

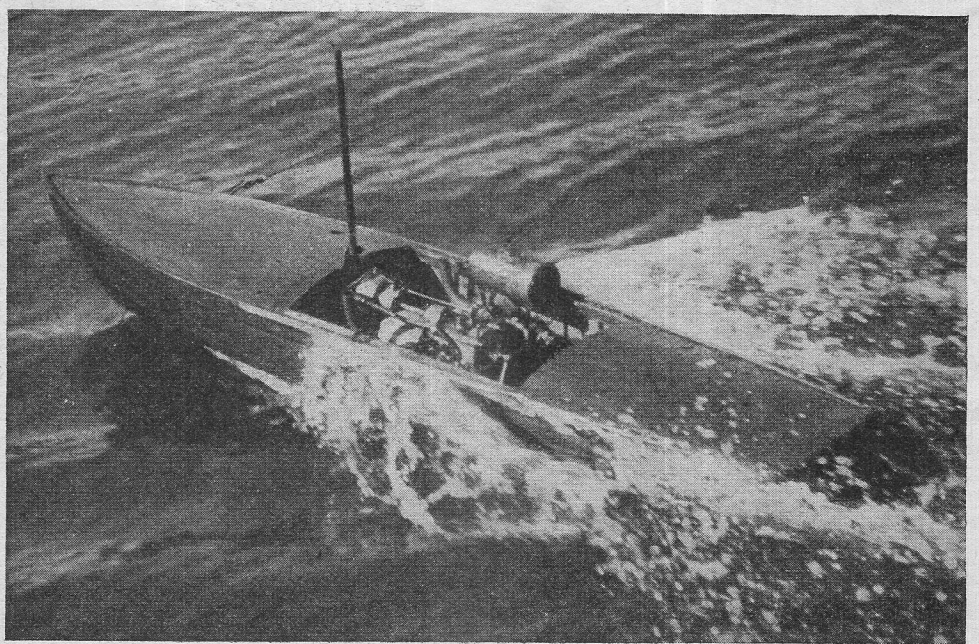
Some of the boats

equipped with a station and other lineside scenic accessories, and was carrying a frequent service of trains on which L.N.E., L.M.S. or G.W. locomotives alternated from time to time.

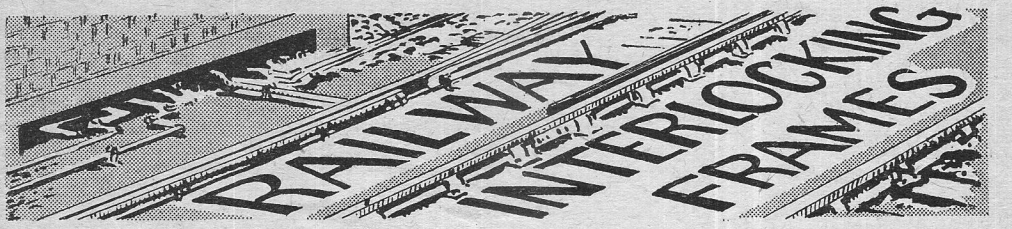
Horizontal and vertical engines, traction engines, a ciné-projector and various items of workshop equipment added to the variety of the exhibits ; but a note of novelty was provided by a whole collection of miniature tools, most of them perfectly usable, though the best results would probably be achieved only if human fingers could be reduced to the same scale ! Mention must also be made of a miniature reproduction of a domestic fire-place and mantel-piece with all accessories, made entirely of brass.

Our survey of this memorable exhibition would be incomplete without a reference to the stand devoted entirely to model sailing yachts of very good finish and attractive appearance.

We venture to hope that the result of this enterprising show may be tempting enough to ensure that a similar collaboration of clubs and the municipal authorities will produce an even more comprehensive effort next year.



" Stormy Petrel," Mr. A. D. Rankine's speed boat powered by a 30-c.c. flat twin, four-stroke engine



By O. S. NOCK, B.Sc., M.I.Mech E., M.I.R.S.E.

No. 3. SAXBY AND FARMER'S "ROCKER AND GRID" TYPE. PART I

JOHN SAXBY was one of the staunchest advocates of catch-handle locking. In this he was not only in open rivalry with the firms of Stevens & Sons and McKenzie & Holland, both of which favoured lever locking, but perhaps even more so with Mr. Easterbrook, who also championed the catch-handle method. Saxby and Easterbrook spent a great deal of time trying to outwit each other and circumvent each other's patents, and in the course of this rivalry Saxby produced, in 1871, his celebrated rocker movement for actuation of the locking; and when to this movement he added the "grid" locking of 1874 he produced a frame that was destined to become "perhaps the greatest medium for arousing world-wide interest in British signalling practice. Frames of this design have been employed in nearly every country where railways exist." Such was the comment of Mr. R. S. Griffiths in his presidential address to the Institution of Railway Signal Engineers in 1934.

Continued from page 270, "M.E." March 14, 1946.

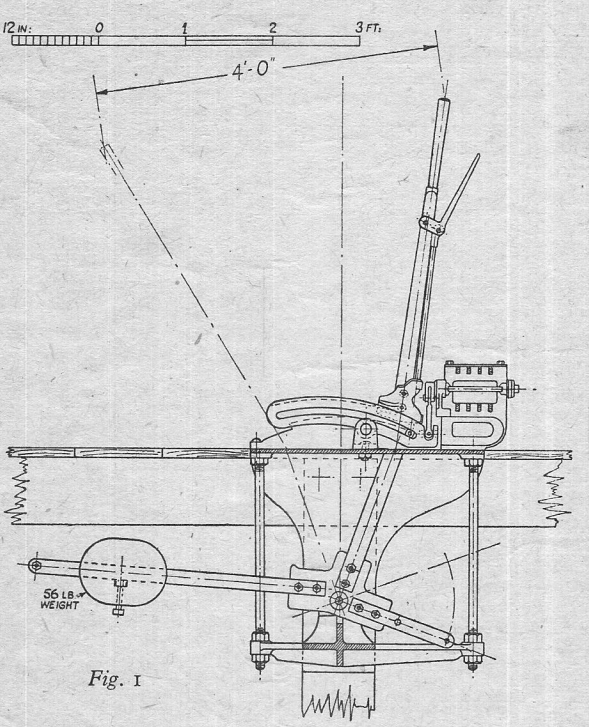


Fig. 1

Fig. 1 shows a cross-section of this apparatus, in which not only the inter-

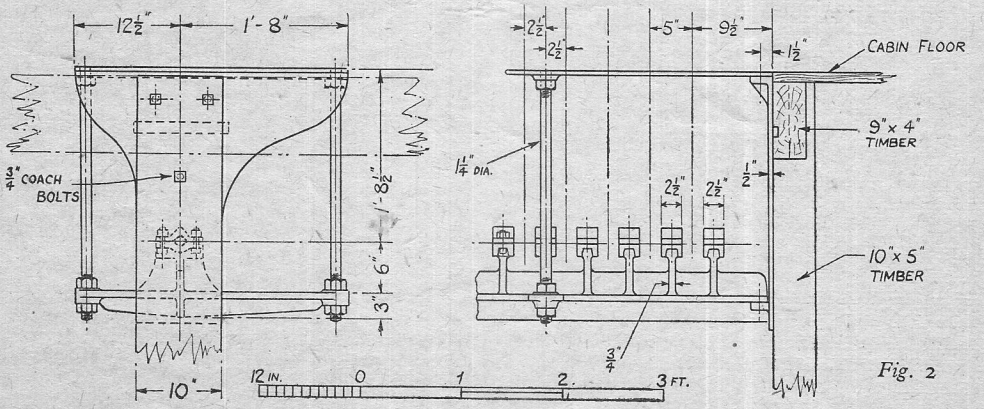


Fig. 2

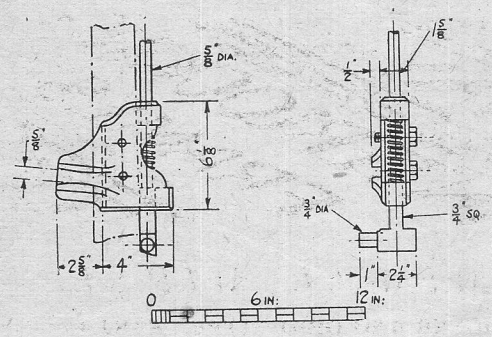


Fig. 3

locking mechanism, but also the construction of the frame itself were of a highly original character. Fig. 2 shows the make-up of the frame. Vertical support is provided, at intervals, by 10-in. × 5-in. timbers, to which latter are bolted the cast-iron standards. The lever quadrants are mounted on a cast-iron floorplate, having a general thickness of ½ in., and having cast slots to accommodate the movement of the levers. This form of floorplate is a most unusual form of construction ; so also is the method of providing intermediate support for the floorplate between the standards. Support is provided from the bottom girder by 1¼ in. diameter rods ; these are screwed into the floorplate and secured with a lock-nut, and at their lower end are clamped to lugs extending from both sides of the main girder. The shape of these lugs and the general construction of the girders are shown in Fig. 2. It will be seen that the standard has no foot for mounting on to a horizontal member. The entire weight of the frame is taken on the timber uprights, and the standard has a rib cast on that is fitted into a notch in the timber, thus relieving the weight taken on the fixing bolts. The vertical timber is anchored to the cabin structure by the notched joint with the 9-in. × 4-in. horizontal member ; this latter also supports the cabin floorboards.

Next for consideration is the method of actuation of the locking, through the movement of the catch handle. The form of the actual handle can be seen from the general arrangement drawing in Fig. 1, and Fig. 3 shows an enlarged detail of the spring and catch-box. The detail of the lowest extremity of the catch-rod should be studied in conjunction with the layout of the rocker shown in Fig. 4. The catch-piece at the bottom of the rod, specified as 2¼ in. wide in Fig. 3, engages the notches on the lever quadrant, and the ¾ in. diameter spigot on the left-hand end of the catch-

(*Continued on page* 362)

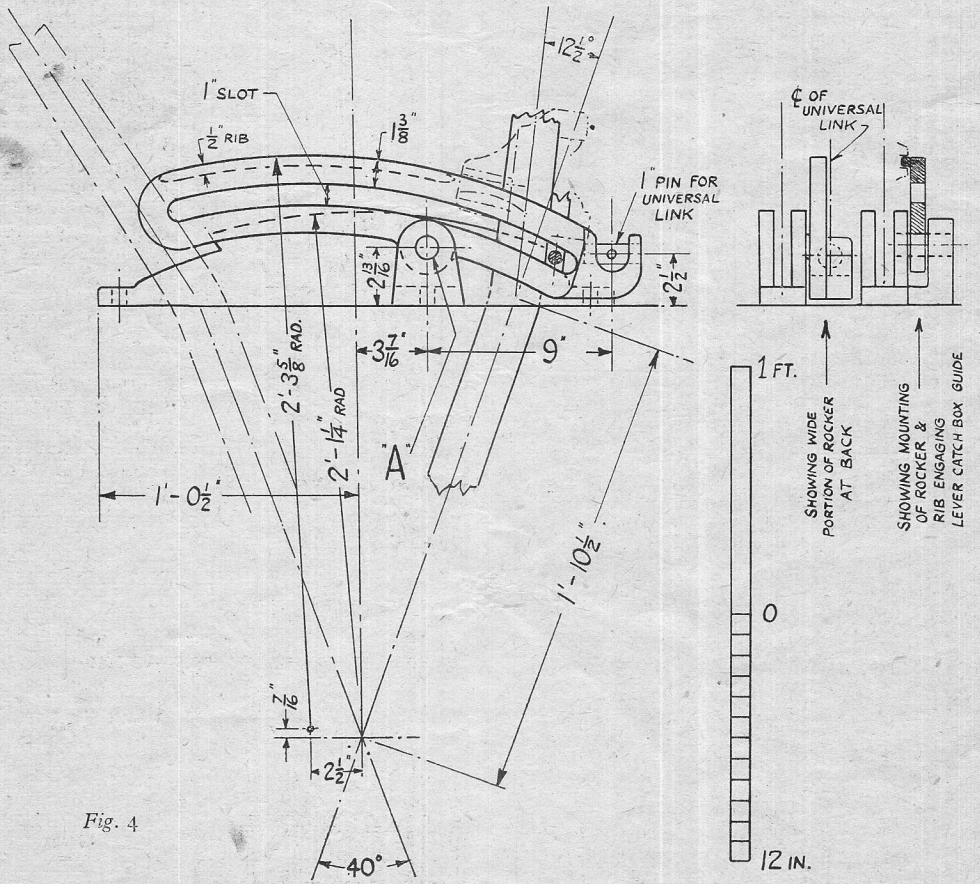


Fig. 4

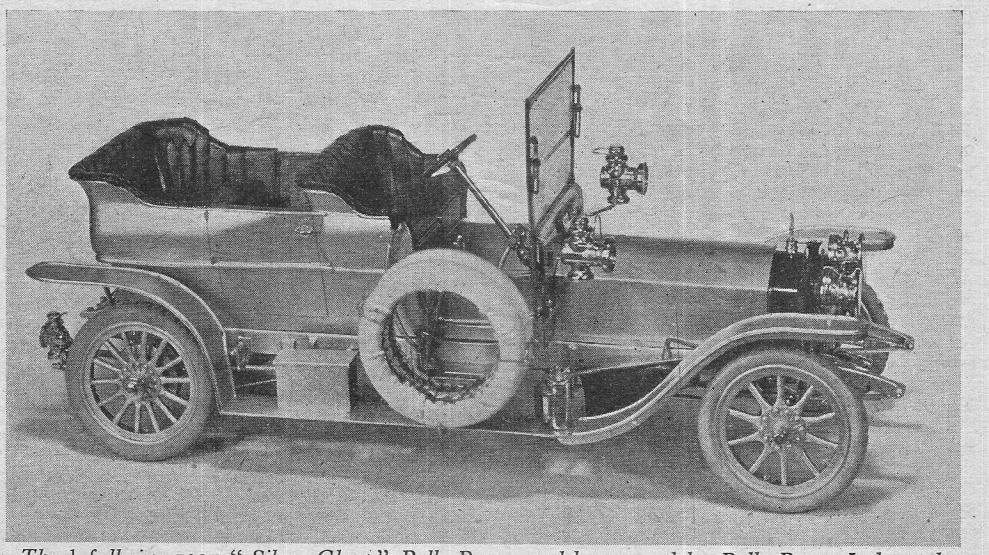
Motor Car Models

W. Boddy discourses on a neglected branch of model engineering

ALTHOUGH interest in petrol-driven model racing cars is increasing considerably and was even featured in a B.B.C. programme last January, it is an unescapable fact that there has always existed a marked apathy towards model motor-cars in general. Compared with model locomotives, boats and aircraft, the model car has virtually no following at all. It seems possible that the chief reason is that, while most people who wish to do so can own a motor car, it is given to very few of us to drive a train, pilot a ship or own an aeroplane, so that there is more incentive to reproduce the last three in miniature. Another thing which has probably mitigated against the model car is that, apart from running it r.t.p., it is almost impossible adequately to control a working model.

It does not follow, however, that the model car should be condemned for the foregoing reasons. In other fields of model engineering, there have been excellent scale models which make no pretence at functioning, and it must also be admitted that many model engineers find pleasure in installing mechanism in their creations and making it work correctly without any subsequent desire to operate such models extensively. Certainly there is no lack of material available to the model car builder. The modern racing car, for instance, presents a fascinating subject, while what could be more satisfying, from the historic and artistic angle, than one of those giant racing cars of that grand age prior to the Kaiser war? Again, what greater challenge to skill than accurately reproducing in miniature an early example of the "horseless carriage," or modelling the cunning structure of pressed sheet-metal which constitutes the present day automobile?

The very dearth of car models prompts me to submit the review which follows, in the hope that increased interest in this aspect of model engineering may result. Not having kept any references to the subject, and writing largely from memory, I am well aware that there will be many serious omissions, and even inaccuracies, in this attempt to survey what has been done by model car constructors down the years. I present it unashamedly nevertheless, in the hope that it may cause others to recall worthwhile models which I have forgotten or have dealt with inadequately, and, particularly, that it may encourage descriptions of future model cars to appear in THE MODEL ENGINEER. In order to achieve some semblance of comprehensiveness I propose to deal with mere toys,



The ¼-full-size 1907 "Silver Ghost" Rolls Royce model presented by Rolls Royce Ltd. to the Science Museum

miniatures, and "near-models,' as well as with proper scale and commercially-produced exhibition models, although I fully realise how much the former will pain the true model engineer.

I think that the first car model to be described in THE MODEL ENGINEER was a remarkably accurate 1910 six-cylinder Vauxhall chassis, built from drawings supplied by Vauxhall Motors Ltd., of Luton, and completed around 1912. This model was lent to the Science Museum in 1927; it was the work of E. W. Frazer and was to $\frac{1}{8}$ scale. It was non-working,* but every external detail was correctly reproduced, even the nuts, bolts, rivets and radiator tubes being specially made to keep them to scale. The model was examined with enthusiasm by the Vauxhall Directors and certainly set a standard which would be difficult to surpass. The description of this Vauxhall prompted a reader to describe a smaller and much simpler, but nevertheless pleasing, model which he had made of a 40/50 h.p. Rolls-Royce tourer, *circa* 1913. As I remember it, the length was about 1 ft., and, although non-working, the model incorporated a final drive made from the winder of a watch.

Letters which resulted from interest in the foregoing models appeared in THE MODEL ENGINEER before the 1914/18 war, and even then the theme was the lack of car models! Apart from a few models of very early French cars which the manufacturers displayed in Parisian showrooms, presumably because, at the dawn of the Motor Industry, real demonstration cars were few and far between, correspondents could not recall any worth-while examples.

Actually, some of the finest car models of all time appeared before the 1914/18 war, and it gives me great pleasure to recall them. I am thinking primarily of that truly magnificent one-quarter-full-size, 1907 "Silver Ghost" Rolls-Royce, made by Braun and Co., of London, N.1, for Rolls-Royce Ltd., in 1908. Every feature of the engine and chassis was faithfully reproduced, the "Roi des Belges" body was removable to display the mechanical details, and the model was over 3 ft. long. It was, of course, made to commemorate the successful 15,000-miles trial of the prototype, when no troubles were experienced other than punctures, the car averaging 15.7 m.p.g. of petrol, and being in such good condition after the run that repairs would have cost just over £2. Three such models were made in all. One was presented to the Science Museum, another to the R.A.C., while the third was normally displayed at the Rolls-Royce showrooms, but went to America in 1938 for the World's Fair, and remained there for safe keeping. Other excellent exhibition models of this era are those at the Science Museum. They include a $\frac{1}{4}$-scale chassis by T. & C. J. Coates, arranged to demonstrate the mechanism of a typical car of the period, the steering wheel and driving wheels being rotatable by handles outside the showcase; a $\frac{1}{8}$-scale 1914 Daimler staff car; a Daimler ambulance of the same scale, and various commercial vehicle models.

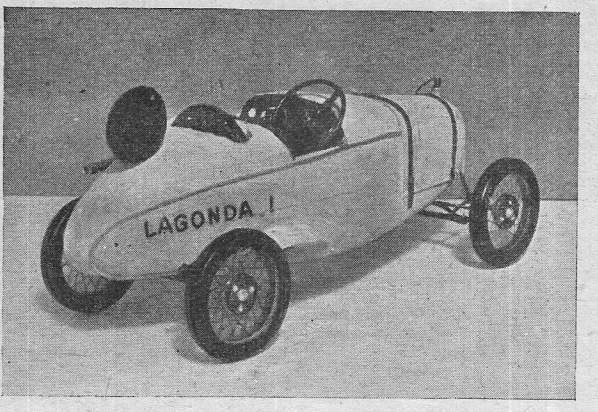
* It could be made to work on compressed air.—ED., "M.E."

We come next upon a very different form of car model. In 1924, as a publicity venture (and what a pleasant one!), the Citroën Company introduced toy replicas of their two-seater 7.5-h.p. and four-seater 11.4-h.p. cars, selling, respectively, for 10s 6d. and 15s. in this country. As a schoolboy, I went one Christmas to Devonshire House to purchase mine. I recall that these clockwork cars were about 1 ft. long, possessed stub-axle steering, detachable disc wheels, a gear lever acting as a brake, and that they portrayed realistically the lines and finish of the real Citroëns. Apparently they set a fashion, for, in the next few years, the toy shops offered other clockwork replicas of actual cars. Of "tin-sheet-and-bent-over-tab" construction, and shamelessly endowed with pressed wheels-cum-tyres, they were, nevertheless, quite effective. In this category were some model "T" Fords, larger 14/40-h.p. Delage and 13.9-h.p. Renault saloons, and, to a still bigger scale, an imposing Hispano-Suiza tourer. The three last-named had stub-axle steering and the attraction of real electric spot-lights. Later the Citroën people re-entered the toy market with a constructional set of one of their later models. The peak effort in this field, however, was undoubtedly represented by the clockwork "P2" Alfa-Romeo racing cars imported some twenty years ago. Made from a casting, they were rather more than a foot long and had cast "wire" wheels and proper rubber tyres. Proportions, detail work and finish were excellent, and these models sold well at 35s. each. I understand that the cost of the dies was shared between Alfa-Romeo, the Excelsior shock-absorber people, and the Michelin Tyre Company as a joint publicity move.

There have been other commercially-produced toy racing cars, including clockwork examples of the famous 1,000-h.p. Sunbeam, which was the first motor car to exceed 200 m.p.h., and the later and even faster Irving "Golden Arrow," the latter a "Kingsbury" product. However, none approached the realism and high standard of the "P2 Alfas" aforementioned, which were truly worth-while replicas of the racing-cars, driven by Campari, Ascari and Brilli-Peri, which won the Championship of Europe by their successes in the classic road races of 1925.

Yet another aspect of car modelling is the miniature replica, usually of from 1/24- to 1/30-scale, either in wood or metal. In 1933, or thereabouts, the Earl of March, well known as a racing driver, formed March Models Ltd., to make miniatures of Austin, Alfa-Romeo, Bugatti, and, indeed, any racing-car to order. His models were but a few inches long, but he contrived to fit fairly realistic wire wheels. Prices were around £7 7s. each, but half-models were offered more cheaply. Actually, Rex Hays, of Steyning, has been making tiny racing-cars for his friends since 1920, and has just introduced some excellent 48-spoke wire wheels (of $\frac{5}{8}$ in. to $\frac{13}{16}$ in. diameter, and costing 8s. 6d. per set of four) in conjunction with Robertson-Aitken. In 1934, R. C. T. Adams offered good models of the then new German

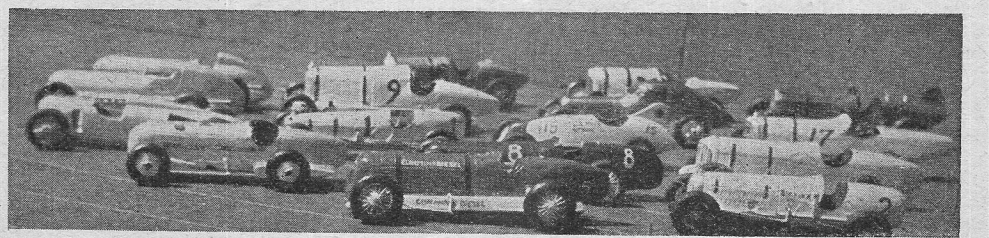
Auto-Union and Mercédès-Benz racing-cars at about £10 each, fitting wire wheels steering-wheel, filler-caps, exhaust-pipe, screen, etc. Later there was quite a flood of miniatures. From Germany came toy examples of "Bi-Motore" Alfa-Romeo, Mercédès-Benz and Auto-Union record cars, notably those by Marklin. These were finished in the national white, but, I am told, were produced also in red, to please Germany's Axis partner! From Germany, too, came the rapid but poorly-proportioned Mercedes clockwork racer and a realistic 328 sports B.M.W., both by Schuco. Not to be outdone, Lines Bros. offered a range of metal miniatures of well-known cars in their "Minic" series, while Meccano Ltd. did likewise with their rather smaller "Dinky" toys. It is interesting that between them the two latter concerns covered such makes as Alvis, Austin 7, Rolls-Royce, Bentley, Daimler, Vauxhall, M.G., Ford, Fiat, Peugeot, Chrysler, Packard, Oldsmobile, Lincoln, Buick, Studebaker, Rover, Humber, Armstrong-Siddeley, British-Salmson and Mercédès. Lines Bros. contrived to fit some of theirs with electric headlamps, no mean feat in cars less than 5½ in. long. One of the most successful attempts at commercial racing-car miniatures was that of Scale Models Ltd. Formed just before the recent war by four young motor-racing enthusiasts, this concern hit upon the happy idea of making replicas of the six-cylinder Maserati, E.R.A. and Alta racing-cars from castings. Well-proportioned, with just sufficient external detail, and finished in any racing colour to choice, these little cars were priced at a modest half-a-crown each, or three-and-six-pence with a simple spring motor. Racing fans bought them as fast as they could be produced. They featured ribbed brake-drums, exhaust-pipe, and steering-wheel, and had detachable, treaded rubber tyres on minute disc wheels. They were sprung on wire springs, the front wheels independently; the motor, if fitted, was wound from the front of the car by a detachable handle, and, clever touch, a spare-parts list was issued. This was indeed an enterprising venture, and it will be interesting to see whether anyone again attempts something on similar lines when the supply of materials improves. I have one of the Maseratis before me as I write; its wheelbase measures 3 in., its track 1⅝ in., the outside tyre diameter is ⅞ in., and the overall length 4⅜ in. There was also a cheap replica of Captain Eyston's two-engined "Thunderbolt," possessed of a body shell which lifted off to reveal the chassis; but, constructionally, it was of the "lead-soldier" order and I hasten to explain that it was not made by Scale Models Ltd.



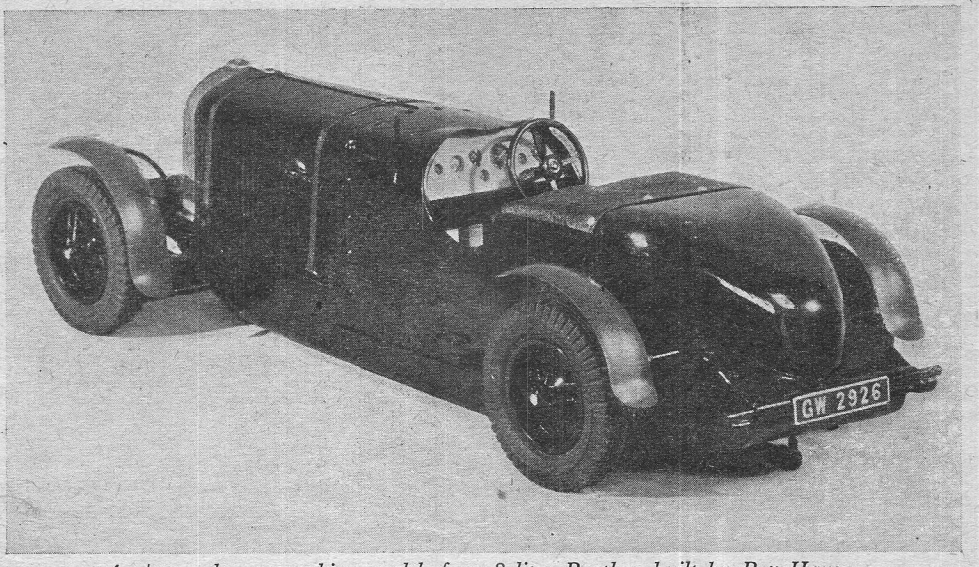
An historic racing car forms the subject of this small "solid" model by G. H. Pearson. Note the transparent wheels

Wilson's Lorries Ltd. supply 4 mm. kits at the present time, which make up into a variety of commercial vehicles, while Modelcraft Ltd. offer plans of A.E.C., Leyland and Sentinel commercials to the same scale. I understand that both these firms are entering the model car field, and plastic Ford lorries have arrived from the States.

The "solids" craze now has a considerable following amongst the amateurs. F. G. Smith, of Newbury, has made a Jeep, a military B.S.A. Scout car, an Austin 7, and a Bentley, to 1/50-scale, and R. S. Brown, of Wimbledon, has produced a Delage, Bugatti and other racing-cars dwarfed by a match stick, but nevertheless having wire wheels, the spokes of which were formed from 10-amp. fuse-wire. G. H. Deason, of Wylam-on-Tyne, started with a 1/30-scale 4½-litre "blower" Bentley 4-seater made from oddments of wood, card, cellophane, etc., the headlamps, for example, being represented by "Epherdine" droppers. Later, he made a



The "solids"—some of the several hundred racing car models to 1/24 scale made by L. Diggett of U.S.A.



A 1/12 scale non-working model of an 8-litre Bentley, built by Rex Hays and displaying plenty of detail

1921 200-mile race Lagonda, 4¾-in. long, for the writer, using transparent wheels with the spokes marked in, and has also constructed a 1/15-scale "Brooklands" Austin 7, and, as a joke, a delightful belt-drive Bedelia cycle-car round some model aircraft disc wheels. C. Posthumus built a "monoposto" Alfa-Romeo racing-car to 1/25-scale, and now has a steady stream of orders coming in for miniature cars of all types. They have included Bentley, Lagonda, and S.S. sports cars, and a 1911 Renault, to 1/24- and 1/25-scale, a refinement being the chromium-plating of metal parts. In America, L. Diggett has a collection of several hundred tiny racing-cars, all to 1/24-scale, dating from before the Kaiser war and kept in special glass-fronted showcases. Before we leave the field of the miniatures, mention must certainly be made of the splendid little model made by Major John Lander of his own "Double Twelve" 4½-litre Bentley, to while away time overseas. Whereas most amateur-made miniatures have been of wood, Lander worked in metal, and there was even a dummy engine beneath the Bentley's bonnet which, although it was hardly larger than a penny, had every external feature of the real engine correctly formed and proportioned. Before Hays and Robertson-Aitken played "Fairy Godmother," wire wheels presented a difficult problem to builders of these miniatures. Posthumus and Diggett have used both dummy wheels backed by brake drums, and proper open wire wheels on their models, depending on the type of car and the standard they wished to set.

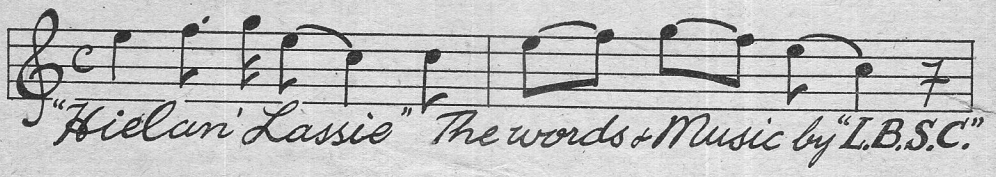
Railway Interlocking Frames

(*Continued from page* 358)

piece acts as bearing for a die-block which slides in the 1 in. wide slot of the rocker. In Fig. 4 the rocker is shown with the lever normal; when the lever catch is raised the rocker is rotated about its pivot bearing "A" (See Fig. 4) so as to bring the slot radial with the pivot of the lever. Thus no movement of the rocker takes place during the stroke of the lever, all movement being made during the raising or lowering of the lever catch handle.

The catch is spring-loaded. The catch-rod is ⅝ in. diameter, as shown in Fig. 3 and a helical spring is threaded over the rod and rests upon a shoulder formed by the ¾-in. square portion of the rod. When the catch-handle is raised the spring is compressed against the upper lug of the catch-box shown in Fig. 3. There is an extended portion on the front face of the catch-box on which are cast two projections to form a groove; when the lever is pulled over, this groove engages a rib on the side of the rocker. This device takes the bulk of the load off the sliding die, and so reduces wear on the die-block to a minimum. Referring now to Fig. 4, the lever quadrant is provided with an extending lug, that gives an additional bearing to the pin on which the rocker pivots. The lever quadrant is bolted at three points to the cast-iron floorplate shown in Fig. 2. The rocker has a general thickness of ¾ in., but at the end farthest from the signalman it is thickened to 2 in. to provide bearing for the 1 in. diameter pin shown in Fig. 4; this thickening of the rocker takes place on one side only, so that the centre line of the pin for the universal link is midway between the centre lines of adjacent levers.

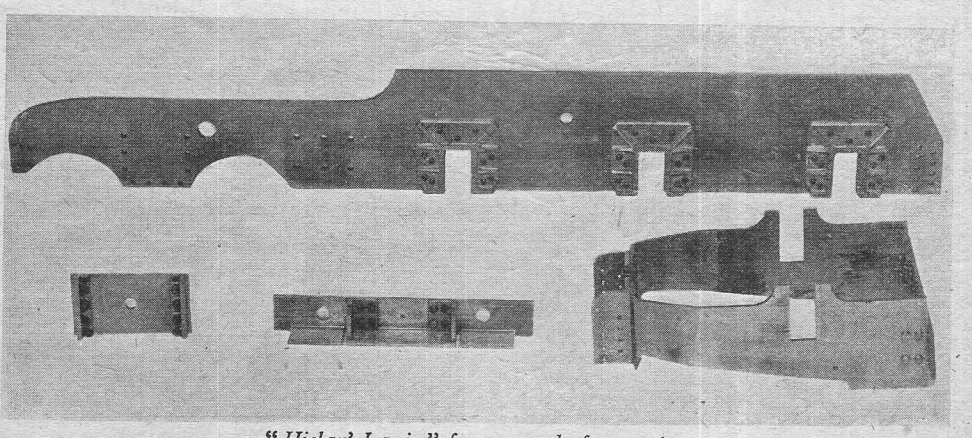
(*To be continued*)



THE piston may be made from drawn or cast bronze, gunmetal, or the alloy used for automobile pistons. Up to the present I have had no acutal experience of dural, so cannot say anything for or against it, but am trying it out in the near future, all being well, having put a dural piston in the huge low-pressure cylinder of my Webb compound "Jeanie Deans." Various correspondents say they have fitted dural pistons and obtained excellent results with them, so I hope it will pan out O.K. If cast metal is used, it should be a different mixture to that used for the cylinders; our casting suppliers will doubtless see to that. The best cast metal I ever used for locomotive pistons was of a pale yellow colour, the cast stick having a shiny black skin as though cast in a graphite mould. It was pretty tough to machine; but when the pistons were finished, they felt kind of greasy to touch, and would have apparently survived a temporary stoppage in the lubrication system. They worked practically frictionless, being loosely packed with graphited yarn, and are still absolutely steam-tight, though they have never been out of the cylinders since the day they were put in, and that was some time before the world went crackers.

To make a piston from drawn rod or cast stick, chuck in three-jaw, face the end, and turn down about $\frac{5}{8}$ in. of the outside to 1/64 in. larger diameter than the finished piston. At $\frac{1}{8}$ in. from the end, form a groove a full $\frac{3}{16}$ in. deep, and $\frac{3}{16}$ in. wide, with a parting tool. Centre the rod, and drill down $\frac{5}{8}$ in. depth with 5/32-in. or No. 22 drill. Part off at $\frac{7}{16}$ in. full from the end. Reverse in chuck; open out the centre hole with a No. 13 drill to $\frac{3}{16}$ in. depth, and tap the rest of the hole $\frac{3}{16}$ in. by 40. Skim off any burr, so that the piston doesn't exceed $\frac{7}{16}$ in. in width. Chuck a piece of $\frac{3}{16}$-in. round rustless steel $3\frac{1}{2}$ in. long, in the three-jaw, and put $\frac{1}{4}$ in. of $\frac{3}{16}$-in. by 40 thread on the end, using the tailstock die-holder, as the die must go on dead true. Chuck the piston again in the three-jaw, with the counterbored side out; put the piston-rod in the tailstock chuck. Run the tailstock up, and enter the screwed end of the piston-rod into the hole in the piston, pulling the belt by hand until the screwed part comes right through, drawing the plain part of rod behind the threads, tightly into the plain counterbore in the piston. I have never found any better method of fitting a small piston to its rod, either for tightness or accuracy, and I've seen a few specimens in my time, as you may guess. The chucks on my Milnes and Boley lathes are fitted in a similar way; but not so tight!

If your lathe has a collet chuck, hold the piston-rod in a $\frac{3}{16}$-in. collet and turn down the piston to an exact sliding fit in the cylinder bore. It must slide freely but not shake. If you haven't a collet chuck, make a split bush so as to hold it truly in the three-jaw, as described for "Petrolea." Briefly, chuck a bit of $\frac{1}{2}$-in. rod about $\frac{1}{2}$ in. long, centre and drill $\frac{3}{16}$ in., make a dot opposite No. 1 jaw, take out and slit with a hacksaw, replace with dot in original position, put piston-rod in centre hole, and tighten chuck. The bush should hold the rod dead true for turning piston to fit cylinder-bore. The most effective test that I know of, to ascertain if the piston is correctly fitted, is to put on the front cylinder cover, up-end the cylinder, and put the piston in the end. It should fall easily to the bottom. Now



"Hielan' Lassie" frames ready for erection

" ditto repeato," but this time put your thumb over the port. The piston shouldn't fall, but should " stay put " at the top of the cylinder. Take your thumb off the port, and it should flop immediately. You should be able to pull it up dead at any part of the stroke, by putting your thumb over the port again ; and with the port " thumbed up " and the piston at the bottom, it should be next to impossible to pull it out. Anybody who has a Samsonian grip and could get it out, should get a pop like an atom bombette going off. The test should be made with the piston and bore perfectly dry ; any moisture (oil or water) between piston and bore, would give false results.

Steam-chest

The steam-chest is a rectangular casting with the gland and tail-rod bosses cast integral, and as the bosses overlap the upper face of the casting, same can't be machined by holding it in the four-jaw, although you can do the lower face that way. If you have a vertical slide (every lathe user who hasn't a milling-machine should have a vertical slide ; I found one mighty useful) the steam-chest may be bolted to it by a couple of clips over the bosses, and the whole issue traversed over a good big end-mill, say about $\frac{5}{8}$ in. diameter, held in the three-jaw. By means of the vertical and cross-slide screws, you can machine every bit of the surface between the bosses, feeding into cut with the top slide handle, and using the others to work the casting up and down and across the cutter. On a regular milling-machine, it is only a few minutes' work to grip the casting in the machine-vice and run it under a slabbing-cutter on the arbor. People wonder how I manage to build locomotives with two lots of writing and drawing, plus seventy or more letters to answer, every week. Well, the answer lies in my machinery—or the fairies previously mentioned !

The easiest way to machine the bosses on a small lathe, is to centre them both, mount between centres (three cheers from the spirit of our late good friend Mr. Alexander) with a carrier on one boss, turn the other, and face the end of the steam-chest ; then reverse end-for-end, and " ditto repeato." To drill and tap for the gland, grip the tail boss in the three-jaw ; if you run up the tailstock centre to the gland boss, it will hold it true whilst you tighten the chuck. Then drill right through with a No. 21 drill, open out to $\frac{1}{2}$ in. depth with letter J or 9/32-in. drill, and tap $\frac{5}{16}$-in. by 32. Reverse in chuck, and drill the other boss with No. 30 drill, tapping the end 5/32-in. by 40. Make a little plug to fit, from $\frac{1}{4}$-in. hexagon brass rod.

Set out the ten screwholes in the position shown, and drill them No. 30. If you haven't a drilling machine, use the lathe, with the steam-chest held against a true bit of hardwood on a drilling-pad in the tailstock barrel. Some raw recruits, who must be related to Tommy Handley's question girl, ask what is a drilling-pad ? Well, it is just simply a flat disc with a boss to fit over the end of the tailstock barrel, or alternatively a taper spigot to fit the centre hole ; work held against it, can be fed up truly to and drilled accurately by a drill in the three-jaw. The bit of wood is to prevent the drill damaging the pad as it breaks through. File off any burrs left by the drill, but don't damage the machined surfaces ; also file up the two sides.

To fit the steam-chest to the cylinder casting, put it in place, and hold it there temporarily by a big toolmaker's cramp. Put the No. 30 drill through opposite corner holes, make countersinks on the cylinder, remove, drill the countersinks No. 40 and tap $\frac{1}{8}$-in. or 5-B.A. Put the steam-chest back again and fix it with two screws whilst you repeat operations on the other eight holes. The steam-chest cover is a piece of $\frac{1}{8}$-in. brass plate, 2 in. by $2\frac{3}{16}$ in. ; put it between the bosses, hold it there with a cramp, and put the No. 30 drill through all the holes and the cover. Mark which is the top, and file off any burrs. The spindle gland is made similar to the piston gland, but it has no head. Instead, it is cross-slotted with a thin flat file.

Slide-valve and Spindle

The slide-valve is made from a block of bronze or gunmetal, drawn or cast, measuring $\frac{15}{16}$ in. by $1\frac{1}{8}$ in. by $\frac{1}{2}$ in. when finished. Bar material $\frac{1}{2}$ in. by $1\frac{1}{8}$ in. is a commercial size ; and if a piece is available, chuck in four-jaw and part off two $\frac{15}{16}$-in. lengths, or else saw full length, and face the sawn ends in the chuck. Cast valves may be supplied with the cylinders ; if so, they can either be milled, or cleaned up with a file. Warning : don't get the valves under size ; better leave them a shade large, and remove any surplus when setting them after the valve-gear is made and erected. Great care should be taken in cutting out the cavity ; if a small vertical miller is not available, hold the valve in a machine-vice attached to a vertical slide on the lathe, and cut out the cavity with a small slot-drill held in the three-jaw. It doesn't matter if the corners are rounded. If you can't manage that, drill a few holes $\frac{1}{8}$ in. deep all over the space marked out for the cavity, and chip to size with a small chisel.

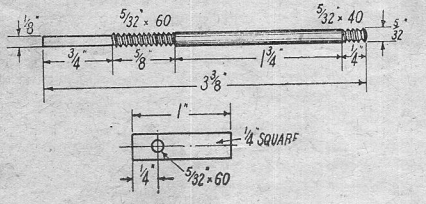
The valve is driven by a nut on the spindle. The regulation buckle may be used instead, if preferred, but there isn't much to gain by its use, because a cavity $\frac{1}{8}$ in. deep in the valve will release the exhaust steam plenty quick enough (" Lassie " will confirm that herself ; just wait till you hear her puff when starting a good load) and the nut-and-slot drive is easier to fit up. The square-bottomed groove could be milled out by a cutter $\frac{1}{4}$ in. wide, on a spindle between lathe centres, the valve being held at correct height in a machine-vice on the cross-slide or saddle ; or it can be end-milled by clamping the valve on its side under the lathe tool-holder, and traversing across a $\frac{1}{4}$-in. slot-drill in the three-jaw. The round-bottomed groove can be done by the former method, if a $\frac{3}{16}$-in. cutter with rounded teeth is available ; if not, use the latter, and either mill to $\frac{1}{4}$ in. depth and finish with a round file, or else mill to full depth and leave the bottom of the groove square. It won't affect the working of the engine.

The nut is merely a 1-in. length of $\frac{1}{4}$-in. square brass rod with a 5/32-in. by 60 tapped hole at $\frac{1}{4}$ in. from one end. The idea of the fine thread is to ensure exact valve setting ; but if

you haven't 60 pitch, use 40. The nut must be an exact fit, without shake, in the slot in the back of the valve. The spindle is a 3⅜-in. length of 5/32-in. rustless steel rod. Chuck in three-jaw, and carefully turn down ¾ in. length to ⅛ in. diameter. Thread the next ⅜ in. with either 60 or 40 pitch, to match the tapped hole in the nut; then reverse in chuck, put ¼ in. of 5/32-in. by 40 thread on the other end, and the cylinder is ready for assembly and erection.

Cylinder Assembly

First pack the piston, and remember that this should be *steamtight, not mechanically tight.* For beginners' benefit, I might here point out that one of the worst piston designs ever perpetrated, was that in which the piston was made in two pieces held together by screws, the idea being to pack the piston with the screws slack, then tighten them up so as to force the packing into close contact with the cylinder wall. Very nice in theory! In practice, the tight pistons mopped up about 30 per cent. or more of the steam power, in friction between them and the cylinder walls; and the slightest failure in the lubrication, resulted in the surface of the packing

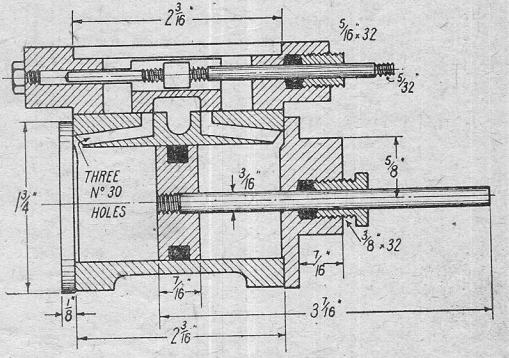


Valve spindle and nut

being ground to powder. The residue being too hard to contain a reserve of oil, the piston promptly commenced to blow. As the steam went out *via* the exhaust, it was unnoticed, and did its bit towards draining the boiler, whilst the power available at the draw-hook was depleted still further.

If the piston is properly fitted, the packing is merely a seal, and may be quite loose. I have tried about every kind of packing applied in every possible way, and the best results were obtained by using a ring of square braided graphited yarn in a groove turned in the piston to suit. This packing is a commercial article used in full-size practice—though not for pistons!—and can be obtained from any engineers' stores in all sizes from ⅛ in. square upwards. As it varies in size, a little, according to who made it, the groove in the piston should be turned so that the packing lies snugly in it with about 1/64 in. standing proud of the circumference. The ends of the ring should be cut on the slant, like a metal piston-ring. When you put the piston in the bore, the projecting bit of the packing will hit up against the end of the casting; all you have to do, is to prod it in all around with a blunt knife, screwdriver, or anything else available, meanwhile pressing the piston down until it will enter the cylinder. This gives the ring of packing sufficient spring to keep in close contact with the cylinder walls, but the friction is practically nil. The packing being springy, instead of being crushed into a solid mass, is able to absorb oil; and even if the lubrication failed completely and was not noticed, this oil, plus the graphite content of the packing, will entirely prevent any damage to the cylinder bore.

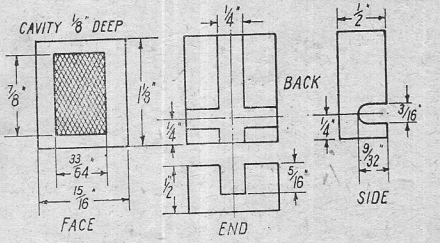
The covers are attached by ⅛-in. or 5-B.A. screws ⅜ in. long; hexagon, cheese or round



Section of inside cylinder

heads, just as you like. The joints between the cylinder covers and the casting, may be made from oily brown paper, or 1/64-in. Hallite, or any similar good proprietary sheet jointing material.

Poke the small end of the valve-spindle through the steam-chest gland, and put the nut on inside the steam-chest; then put the valve in place and assemble as shown, with rectangular paper or jointing gaskets between steam-chest, cylinder casting, and cover. Either studs or screws may be used to fix the lot. If screws, they should be ⅛-in. or 5-B.A., and 1 in. long below the head, which may be any shape available. If studs are used, make them from ⅛-in. round



Slide-valve

steel, 1⅛ in. long, with ¼ in. of thread on each end. Pack the piston and valve spindle glands with a few strands of graphited yarn, and the cylinder is complete. I guess Inspector Meticulous will want to know how the steam is going to get in, as we haven't drilled a hole anywhere for it. Well, as a famous statesman once remarked, "Wait and see"; I'll indicate exactly where to drill it when I have made a drawing of the steam and exhaust connections.

Erection of Cylinder

The cylinder can now be temporarily erected in its correct position. Place it between the frames right over the top of the bogie-bolster, and let it rest on the angles of same, then check positions. The flanges should just come level with the edge of the frame where it is cut away to clear the bogie wheels ; the front of the casting should be 3 in. from the front end of frames, about halfway up, and the top of the front end of the steam-chest should be approximately $\frac{1}{16}$ in. below top of frame. If the cylinder is too high, file a little off the fixing angle of the bogie bolster, to let the cylinder down a shade lower. You don't need any elaborate apparatus to line up the cylinder with the crank axle. Put a bit of $\frac{1}{4}$-in. or $\frac{5}{16}$-in. round rod in the chuck, about 1 in. long, and drill a $\frac{3}{16}$-in. hole right through it, so that it will fit on the piston-rod without shake. Put it about halfway on, and then put a bit of straight $\frac{3}{16}$-in. silver-steel in the other end. You now have what is virtually a long extended piston-rod which will pass between the webs of the crank, and it is easy enough to " sight "this and adjust the inclination of the cylinder (very slight) so that the rod cuts through the centre line of the axle. That is all I do, and I never have the slightest trouble. If the rod is the weeniest bit above or below centre, it doesn't matter ; some big engines are deliberately set " high," when new, so that as the springs become weaker and the engine settles down, the piston-rod centre-line won't fall below wheel centres.

Put a big cramp over the frame, to prevent the cylinder moving, or hold it in any other manner you like ; poke a No. 21 drill through all the holes in the frame, both sides, and make countersinks on the cylinder flanges.

Remove cylinder, drill the countersinks No. 31 and tap 5/32-in. Whitworth—screws are available in this thread—then replace cylinder and put a couple of screws each side just to hold it temporarily. It will have to be removed again shortly, to fit the guide bars, crossheads, etc.

Postscript on the Feed Pump Erection

A reader says his hornblocks are on the large side, and he can't get the pump stay back far enough to tally with the measurement given in the erecting instructions. Shall he file the pump stay or the hornblocks ? No need to file either ! The exact position of the pump in a fore-and-aft direction doesn't matter a Mohne. Simply butt the stay up close against the hornblocks and put the screws in. All the difference it will make, is that the eccentric rod will be a weeny bit shorter ; and that will be automatically accounted for, if the length of the eccentric-rod is obtained from the actual job as described in the instructions.

Sandblasted !

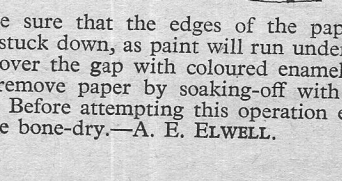
Somebody sent me a superheater element of the spearhead pattern for inspection, saying he had taken it out of a 2½-in. gauge 4-4-0, and added a few pungent remarks about superheaters in general and how they burnt out ; concluding by saying he was fitting one of half the length, with a block return bend as specified for " Petrolea." He also assumed that my adaption of a block return bend was a belated admission that spearheads were no good ! I was sorry to contradict our friend, who wrote in all good faith ; but one glance at his element was sufficient to reveal the fact that it wasn't *burnt* out, but " sandblasted," in a manner of speaking, being literally scoured away by grits and cinders sucked through the flue by an excessively heavy blast. In full-size practice in the old days, when engines burnt coke and weren't notched up overmuch, copper tubes suffered badly in much the same way, the walls being scoured so thin that burst tubes were a commonplace. This led to the almost universal use of brass and steel tubes. In our friend's case, his cylinders have overlarge milled passageways, and his own arrangement of valve-gear ; it takes a lot of steam to fill the cylinders and passageways, and the exhaust has considerable volume and pressure. He runs at between 100 and 120 lb. pressure, and at one time a pump which would have flooded the largest of my 2½-in. gauge boilers, would not maintain water level with his engine hauling a single passenger. The inference is obvious !

That superheater elements do not *burn* out, is proved by the fact that I have two oil-fired locomotives with water-tube boilers, the superheaters being loops in the blowlamp flame, which become red-hot when getting up steam, and remain so whilst working. It was the extraordinary low water consumption and general liveliness of these engines, that prompted my experiments with superheater temperatures. I have never had a failure with a spearhead superheater ; all my coal-fired engines have them except the rebuilt " Cock-o'-the-North," and she has an experimental boiler having both elements in one big tube ; the elements have block return bends, and project into the combustion chamber. Apart from the fierce heat of the spray burner on " Petrolea," which might have melted the brazing on a spearhead, I learned from correspondence received, that quite a few amateur coppersmiths managed to " bung up " the spearheads when brazing them, but there was no chance of doing this with a separate block ; hence the alternative. That is all there is to it !

LINING MODEL LOCOMOTIVES

I have noticed that very few are complete with the scale linings round tender sides, etc., so here is a simple way of making a neat job of it.

For example, if the lines are to be 1/32 in. thick, cut brown paper strips as shown in the sketch, and paste in position, leaving 1/32-in. gap.



Make sure that the edges of the paper are firmly stuck down, as paint will run underneath. Brush over the gap with coloured enamel when dry ; remove paper by soaking-off with warm water. Before attempting this operation enamel must be bone-dry.—A. E. ELWELL.

*IGNITION EQUIPMENT

By EDGAR T. WESTBURY

A comprehensive review of the working principles, design and construction of electrical ignition apparatus employed on all types of internal combustion engines

Part II—Design and Construction (*Continued*)

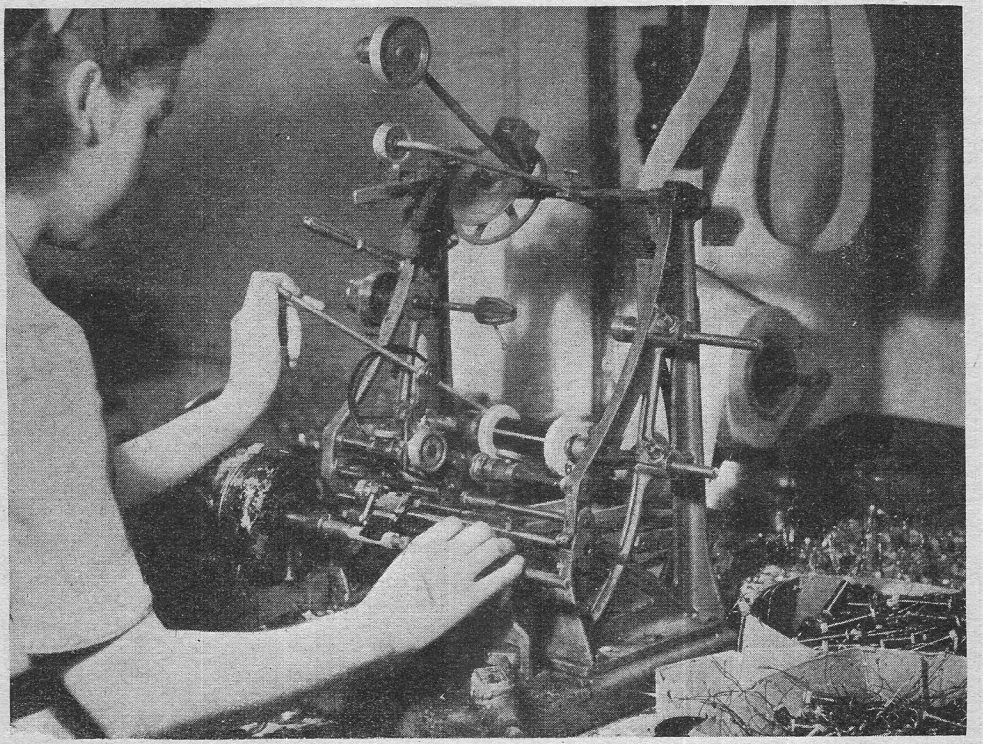
A NUMBER of readers have asked my advice on the design of coil winding machines, and as this subject seems to be of fairly general interest, and applies not only in connection with ignition apparatus, but to many other electrical appliances, a few comments thereon may be appropriate. There are many ways of winding coils, and the types of machines which have been evolved for the purpose are equally diverse. I have personally experimented with several machines and methods, though I have been mostly concered with obtaining results fairly quickly, and have therefore been but little disposed to investigate the design of the machines more deeply than was necessary to accomplish this end. Two of my machines have been adapted from a popular type of miniature lathe, and have served their purpose quite well, though I should, on the strength of experience with these machines, regard it as almost as easy to build a complete machine, designed specially for its job.

The amount of work which is justified in the construction or adaptation of appliances for coil winding will, of course, depend on the number of coils one expects to produce. If only one or two coils have to be made, it would seem out of proportion to spend months in making a special machine—but it may work out less troublesome in the long run than trying to do the job with inadequate and unsuitable equipment. In my own case, I started out with the intention of producing one or two coils for my own use, but what with the experimental work in coil design, and the number of coils made to oblige friends, I found eventually that a special coil winding machine was a sheer necessity.

* *Continued from page* 325, "*M.E.*" *March* 28, 1946.

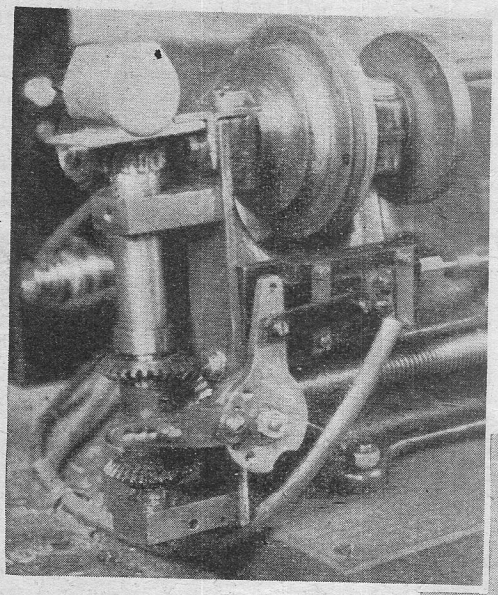
Hand Winding

Although it cannot be ruled out as completely impossible, the winding of ignition coils entirely by hand is so tedious that it may generally be



Winding miniature ignition coils to "M.E." formula on a "Douglas" automatic coil winder. (By courtesy of Messrs. G. J. Hastings, Worcester)

regarded as impracticable. Apart from the skill and patience required to lay several thousand turns of wire evenly, and the mental stress of keeping count of the number of turns, this method involves far more handling of the wire than is desirable. The advice frequently given—presumably by those who know—to wear resin-impregnated leather gloves when handling the wire, seems to me very difficult to carry out in practice, because with wire of sizes below 40 gauge, it is no easy matter to manipulate it with the bare fingers, not to mention the extra encumbrance of gloves.



The bevel cluster reverse gear for the lead screw of the writer's winding machine. (Note the Veeder counter geared to 1/10 spindle speed)

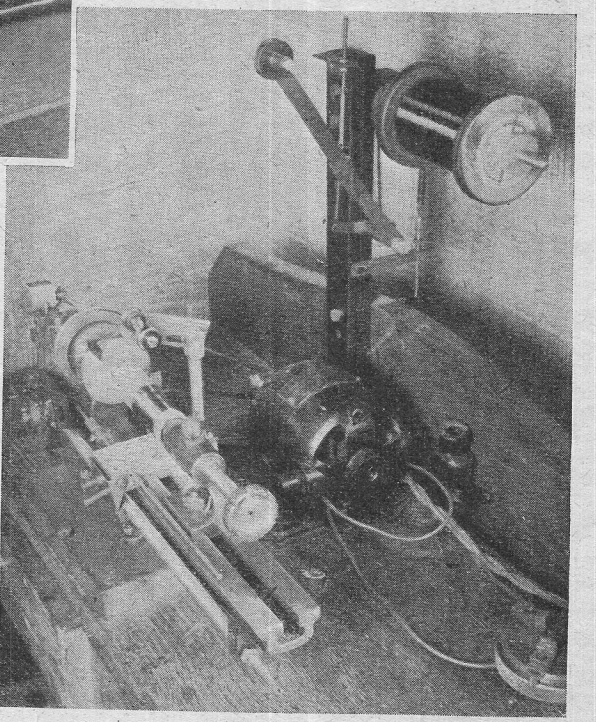
Hand winding in the true and primitive sense—that is, without the aid of any mechanical appliance of any kind—is hardly ever attempted, as it is so obviously desirable to fit up some simple form of winding spindle for work of this nature. The small polishing heads, which used to be obtainable at very low prices at all tool shops before the war, have been extensively used for winding, not only by amateurs and jobbers, but also in production work. Operations involving pile winding, such as electric-bell bobbins, transformer and armature coils, headphones, etc., are often wound in this way. Several simple winding devices of this nature have been described in THE MODEL ENGINEER at various times.

When any form of winding spindle is used, the term "hand winding" is not strictly correct, and it may more be appropriate to class the operation as "hand laying" of the windings. The evolution from such simple devices to a more or less elaborate winding machine, by the addition of some form of automatic feed, a turn counter, and so on, follows quite logically, and has in many cases been applied to existing spindles.

The Lathe as a Winding Machine

It is, of course, quite evident that any form of lathe embodies the elements of a winding machine, and in the case of a small screwcutting lathe as used by most model engineers, it provides the important facility of a self-acting feed, which can usually be geared to suit the pitch of the wire being wound. Many ignition coils have been wound on such lathes, to my knowledge, and the constructor who only wants one or two coils, and is prepared to exercise care and patience in winding them, may find this method quite successful. The only special addition required in this case is some form of guide for the wire, which may take the form of a free-running pulley having a fine vee groove, mounted on the slide in a suitable position to cause the wire to pass round a part of its circumference before reaching the coil being wound.

The ordinary lathe, however, as I have pointed out in earlier issues, is not an ideal machine for winding very fine wire. Perhaps its most serious limitation is in respect of sensitivity, both the inertia of the main spindle and the amount of



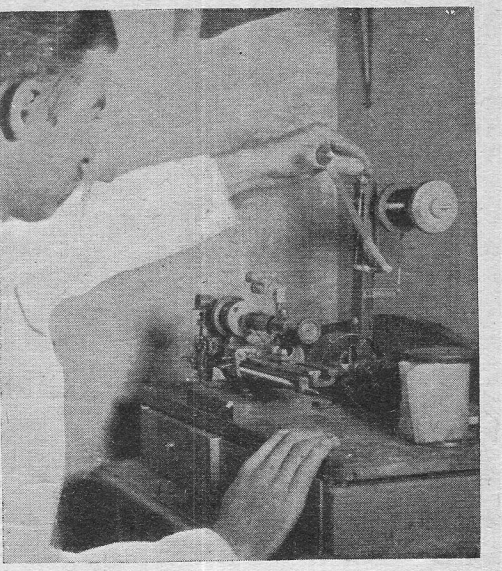
The self-compensating tension brake as used on the writer's winding machine

power applied to it being rather excessive for this work. It is extremely important to be able to stop or start the spindle instantly, to accelerate or slow it down very gradually, or to " inch " the spindle round a fraction of a turn at a time. The speed of the average model engineer's lathe is insufficient for really expeditious winding of coils having many thousands of turns. Reversal of feed in the average lathe, even when a tumbler reverse gear is fitted, involves some delay, due to the backlash in the gears and lead-screw nut, which may be fatal to success in coil winding, by allowing turns to pile up at the ends. All these disadvantages can be remedied, by the exercise of ingenuity in devising special lathe additions and fixtures, but the work involved may be many times greater than that of making a special machine.

Automatic Coil Winders

While these are obviously based on lathe principles, they are often very different in design to the orthodox lathes, and in some cases are reversed end for end compared to the latter ; that is, having the headstock and driving gear at the right, though this particular feature does not appear to have any very special advantages. The feed mechanism is in most cases operated by a lead screw, though other methods, including the use of sine bars or cams, have been employed. Change-speed gearing on screwcutting lathe principles, for adjusting the rate of feed, is fairly common, but variable friction gearing is also extensively used.

In nearly all cases commercially-produced winding machines have some provision for sensitive control of the spindle speed, by means of a friction clutch or variable-speed motor, and also means of controlling the tension of the wire as it is fed from the reel. Automatic reversing of the feed is usually provided, and an optional



Adjusting the tension control gear to suit gauge of wire being wound

feature of many modern machines is an attachment for interleaving the layers of wire automatically. This is obviously a great advantage for production work, not only to expedite winding, but also to avoid the necessity of touching the work by hand. Spindle speeds up to 6,000 r.p.m. are employed for very fine coils, and for intensive mass production work, multi-spindle machines handling up to twelve coils at a time are employed.

(*To be continued*)

Kodak Recreation Society

On February 28th last, in the supervisory dining hall of the Kodak Recreation Centre, members of the K.S.E.E.C. and their friends of local model societies, including the Harrow Model Society and the Harrow Model Aero Club, enjoyed a most interesting evening with Lawrence H. Sparey, on the small compression engine and its application to model aeroplanes, etc.

Mr. Sparey began by running his demonstration model to show just how simple these interesting types of I.C. engines really are, then went on to describe the construction, manufacture, and running. One thing that emerged was that, with the development of this small and efficient engine, worries that are attendant with the petrol I.C. engine cease to exist, such as accumulators for starting, and that irksome spot of bother, the contact breaker ! Timing is possibly a little difficult to undertake, but here the fuel supply is all that requires to be interrupted.

Mr. Sparey also discoursed on Italian and French models, including details of an engine of Swedish design ; the types of fuel used, and mentioned that in certain compression engines the mixture can be one necessitating a laboratory mix ! This seemed to be more apparent with French types. Mr. Sparey said that he was working on an engine of 0.5 c.c., and details had been given him of an engine of 0.045 c.c. capacity for use in models of some 18 in. wingspan !

Mr. Sparey described some interesting forms of engine-mountings that he had tried out, and stressed the point about getting an undercart to look like the proper thing, by using piano-wire as the main frame, then covering with balsa and fairing off to the usual streamline section, so that the undercart is also a thing of beauty and not a necessary evil !

Several questions were asked, dealing mainly with constructional details and technique, and the evening closed with a very hearty vote of thanks to Mr. Sparey.

*A CONGREVE CLOCK

By Dr. J. BRADBURY WINTER

Details, dimensions and instructions for making an attractive timepiece

ALTHOUGH the clock has no hands at present, the spectacular rolling ball and rocking plate mechanism is now finished, and can be set running even if unable to show the time.

I must mention three points :—

(1) I wrote of wires going to a transformer ; but since the Westinghouse " M3 " unit must have D.C. current, there must be a rectifier between the " movement " and the transformer. The transformer should be set for the lowest voltage that will do the work, probably about three volts.

(2) I discussed the levelling of the clock, but not the balancing of the plate. Note carefully whether the plate tips over equally briskly in each direction ; if not, make another plug to fit in the eccentric, longer or shorter as required. In the unlikely event of the eccentric alone, without any plug, over-balancing the rocking lever, a metal disc is to be put on the screw-pin at the top of the connecting-rod between the washer and lever ; fine adjustment being carried out as before with plugs in the eccentric.

(3) A hole has to be drilled through the cornice to allow the key to reach the winding square. Let it have ample clearance, and then fix a brass plate over the hole with a screw at each end, and a central hole an easy fit on the key, the plate being located with the key through it and on the square.

We can now leave the ball rolling, merely winding up the clock every twenty-four hours, and turn our attention to the synchronising mechanism. This and the gear for starting and stopping automatic winding, are both contained between two brass plates $\frac{1}{8}$ in. thick, with four pillars $\frac{3}{8}$ in. diameter, $2\frac{1}{2}$ in. long, drilled and tapped at each end for 3-B.A. screws. (See Figs. 29 and 30.) The front elevation shows the hands arbor as a $\frac{1}{4}$ in. circle on the centre cross lines ; the front plate is removed in this view, but is seen in the plan (Fig. 30), which also shows the top edge of a steel bar 1 in. × $\frac{1}{4}$ in. to which the front plate is bolted with two $\frac{1}{4}$ in. Whitworth screws and nuts near each end (not shown) while the bar in its turn is similarly attached to $2\frac{1}{2}$-in. lengths of 1-in. angle iron screwed on the wooden pillars, one of which is shown in the plan.

Close behind the front plate a 4-armed lever is pinned on the hands arbor, with a small wheel (or runner) $\frac{3}{8}$ in. diameter, in a slot at the end of each arm. Behind this is a cog wheel, gearing with another of equal size, to work the gear for

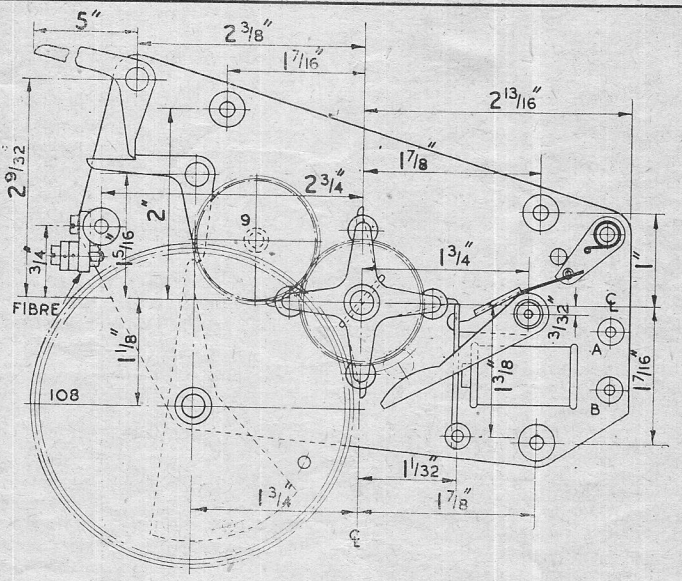


Fig. 29. Front elevation of the synchronising mechanism

* *Continued from page 313, " M.E." March 28, 1946.*

starting the motor. Behind the cog wheel on the hands arbor is another 4-armed lever ; the tip of one arm on the horizontal centre-line is seen resting on the top edge of a vertical steel plate $\frac{1}{16}$ in. thick, soldered below to a flat on a $\frac{1}{4}$ in. arbor pivoted between the plates. This is the armature of the pair of bobbins to the right. At the right-hand end of the plan, a full-face view of the armature is given ; the small hole is for the attachment of a spiral spring to keep it pulled away from the bobbins ; the gap on the left of the hole, which is, of course, actually vertically above it, provides space for a small hooked lever (Fig. 29, front elevation). When the bobbins pull the armature to them, the hooked lever flies up and holds it ; in so doing, it breaks the circuit to the bobbins almost instantaneously after the current has passed through them.

On the top edge of the hooked lever a strip of brass is soldered, $\frac{1}{8}$ in. wide, having a groove filed along its whole length with a "three square" file, to take a piece of piano wire, 22 thousandths in. thick, which projects from the right of the lever like a tail. The exact thickness of the tail is important, found by experiment.

When the lever is in the position shown, the springy tail presses on a pin driven into the short "contact lever," but insulated from it by a fibre bush in the pin hole. The bush has a flange which ensures that the tail will never touch the side of the contact lever. The pressure of the tail on the pin forces the contact lever against the contact spigot on the left, and when the master clock sends out a flash of current every fifteen minutes, the bobbins attract the armature, the hooked lever flies up to hold it, flicking its tail up on the projection above the gap on the armature.

The 4-armed lever on the hands arbor is shown held up on the top edge of the armature ; the mitre wheel loose on the other end of the arbor, continues 10 revolve with each tilt of the rocking plate, but slip will occur between the fibre discs of the clutch, and the hands arbor will not move until the armature is withdrawn. Fifteen minutes later, the armature must be away from the bobbins, ready to intercept the next arm on the hands arbor, which is rated to arrive a few seconds early. The hooked lever must, therefore, be pressed down to allow the spiral spring to pull the armature away from the bobbins against a stop pin in the back plate. A lever, twice as long as the hooked lever (both tight on the same arbor), is seen pointing downwards and to the left. The runner in the horizontal slotted arm will soon impinge on this lever, which will have swung upwards with the hooked lever ; and when the runner reaches the position indicated by the dotted circle, it will have pushed the lever down again to the position in the drawing, carrying the hooked lever down and freeing the armature.

During the next five minutes, the runner will pass on to the downward vertical position, leaving ample room for the long "cocking" lever to fly up when the "time signal" is given by the master clock. It cannot fly up before that, because the top of the hook is caught under the projection at the top of the armature.

Obviously, the tail must be bent to press just right on the insulated pin, and the spring on the sleeve of the contact lever must similarly be

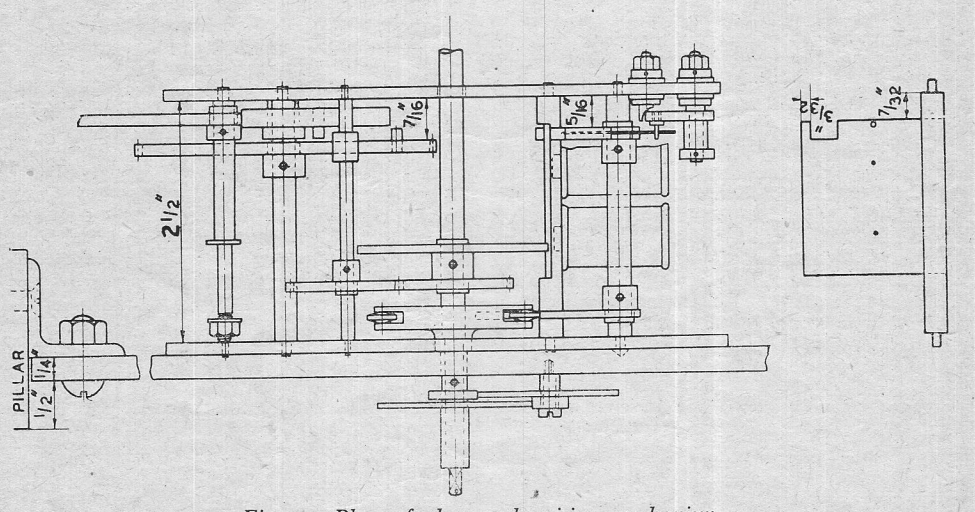


Fig. 30. Plan of the synchronising mechanism

away from the pin on the contact lever, which comes away from the spigot, thus breaking the circuit.

There is a light torsion spring, easily adjustable, on the sleeve of the contact lever, which not only brings it away from the spigot, but, by following up the retreating tail, keeps the hooked lever adjusted till just sufficient to make a gap of about $\frac{1}{32}$ in. at the spigot when the springy tail retreats. These adjustments are quickly and easily made.

The plan (Fig. 30) shows the terminals for the wires, one on the spindle of the contact lever, the other on the contact spigot, both being insulated with fibre washers. It is convenient also

to provide two anchorages for the wires at "A" and "B," Fig. 29.

The master clock mechanism is very simple, and will vary with the type of clock chosen. Mr. Stephens makes use of a grandfather, while I fitted a contact in a "carriage clock." A disc, about 1 in. diameter, has four pins projecting from one face near the periphery, like the pin disc of a striking clock. This disc is fixed tight on the minute hand arbor at any convenient place. A small "trip lever" is mounted on an insulated spigot, much the same in design as the contact lever. Every fifteen minutes one of the disc pins will complete the circuit by making contact with the trip lever.

It may take several minutes before the pin gets past the tip of the lever, allowing it to fly up again ready for the next pin, but this continued contact is of no consequence because the circuit was instantly broken by the hooked lever flicking its tail away from the pin on the contact lever and thus allowing that lever to come away from the contact spigot.

Dry cells or accumulators are quite suitable for this mechanism, as the current used is very small. In "carriage clocks," the minute hand arbor has a square on it at the back for setting the hands to time; this makes a convenient fixing for the pin disc, which is pushed on the square. The pins must, of course, be planted on the disc so that they make contact with the trip lever just when the minute hand is at the quarters.

One of the master clock wires goes to the insulated trip lever spigot, the other (earth) may be attached to any part of the clock frames; but in practice there was an occasional failure, due probably to oil in the bearings of the hand arbor. This was completely cured by pinching one end of a short piece of piano wire under the head of a convenient screw, the other end pressing direct on the hand arbor, thus ensuring good electrical contact.

Passing on now to the starting and stopping of the motor, the cog wheel on the hands arbor gears with another of equal size on its left, mounted on the shaft of a 9-leafed pinion gearing with a wheel having 108 teeth, which, therefore, makes one revolution in 12 hours. A "tumbler," cut from $\frac{3}{16}$ in. sheet brass, is loose on the arbor of the 108 wheel. The side elevation shows it with its beak above, on the vertical centre-line, and its fan-shaped heavy tail below; it lies 5/32 in. behind the cog wheel, and both it and the wheel have a pin projecting $\frac{1}{8}$ in. towards each other and at equal distances from the centre. When the pin on the wheel comes up against the other one, it will carry the tumbler round with it until, about six hours later, the heavy tail will be above, and the beak below.

The beak extends farther from the centre than the curved edge of the tail, hence the beak cannot pass the end of the vertical lever above it in the drawing without tripping it, while the tail leaves it untouched. A little further rotation brings the tail to the right of the vertical line; it falls to the bottom, and the beak strikes the tip of the bell-crank lever above it, drawing the step on its horizontal arm away from the end of the catch lever at the top left corner of the drawing. The long horizontal arm at once falls. A mercury switch is clamped on its arbor, and the tilting of the switch completes the circuit to the motor which begins to wind up the weight. We have seen that the weight has a rod clamped on its top lid. In due course this rod will reach the long arm and raise it to its former position, tilting the mercury switch back again and breaking the circuit.

Meanwhile, the other arm of the catch lever will have been brought back to the left of the step, which flies up to hold it until the tumbler again releases it 12 hours later. It should be noted that the impetus of the tumbler carries its beak well to the right of the vertical arm after tripping it, and on swinging back, it will continue to stay on its right side.

To adjust the time of winding, knock out the tapered pin in the bush of the cog wheel on the hands arbor; slide it along until the wheels are disengaged; set the hands to the time desired; turn the 108 wheel till the tumbler falls; re-engage the wheels and replace the pin.

In an ordinary way when wishing to set the hands to time, they will be held up every fifteen minutes by the armature; but it is easy to keep a finger on this to hold it off. There is, however, no impediment to turning the hands backwards, the 4-armed lever passing the armature in that direction like a click and ratchet; but, eventually, there will occur a hold-up when the beak of the tumbler comes up against the vertical arm of the bell-crank lever in an anti-clockwise direction. This, again, can be passed by manual interference.

In the next article I hope to give details and hints on the construction.

(To be continued)

For the Bookshelf

Titled Trains of Great Britain, by C. J. Allen. (London: Ian Allan Ltd.). Price 6s. 0d.

It would be scarcely possible to find anyone better qualified than Mr. Cecil J. Allen to deal with such a subject as trains; he has written about them for nearly forty years and has travelled in them for something like 2,000,000 miles. It may come as a surprise to many readers that no fewer than seventy British trains are known by distinctive names, or titles; yet that is the number described individually in this entertaining little book of 128 pages. Numerous photographs, the work of several well-known experts, are included, adding much to the interest and attractiveness of the book.

The descriptions are, of course, authoritative, historical and, sometimes, anecdotal in character; but all are such as to arouse the enthusiasm of anyone who loves our trains.

Letters

Tool Holders

DEAR SIR,—In your readers' letters I noticed two letters relating to the tool holders for lathes, the American slipper type and the English type.

As a tool turner, I have worked in many tool rooms for the last forty years, and for the most of that time I have worked American lathes (which I think are much the best for precision work). I bought a small English lathe for myself some time ago, but was so annoyed at having to put bits of tin, emery-cloth, etc., to get the dead centre every time one had to change a tool. I sold it at about half price I gave for it. With the slipper type, one only had to make one movement to get the dead centre without all that fuss and bother. As regards it altering the top and front rake, I have never had any trouble that way, as one can see if the holder is reasonably level and, if not, use only *one* piece of packing.

The convenience of this type is overwhelming and it will hold anything the lathe will pull. I am working an English lathe at the moment, and the waste of time messing about with bits of packing, apart from the annoyance, is—*verb. sap.*

Yours faithfully,

Northolt. W. J. STEVENS.

Photographic Enlargers

DEAR SIR,—May I venture a comment on the most excellent article by Mr. C. R. Jones, on "A Low Voltage Photographic Enlarger," in a recent issue of "ours."

In the 6th paragraph of the first column he mentions "a circular piece of frosted or ground glass laid *on top of* the condenser," and later on page 264, "*on top of it* is placed a circular piece of ground glass."

May I suggest that Mr. Jones is defeating the object of the condenser in placing the ground glass between the condenser and the source of light, as the ground glass disperses the light, and the condenser is supposed to gather the rays of light diverging from the source and render them parallel, giving an even illumination. If the ground glass is placed between the condenser and the negative to be enlarged, I feel sure that the results will be much better, or alternatively, quite good results can be obtained with a ground glass only, omitting the condenser, although a longer exposure may be needed.

Yours faithfully,

Wakefield. D. A. CRESSWELL.

Retaining Polished Surfaces

DEAR SIR,—Do you think anyone is able to say from practical experience how it is possible to treat the surface of a polished copper boiler with brass smokebox in order to retain its brilliance? The locomotive, 3½-in. gauge, will be a worker and not an ornament.

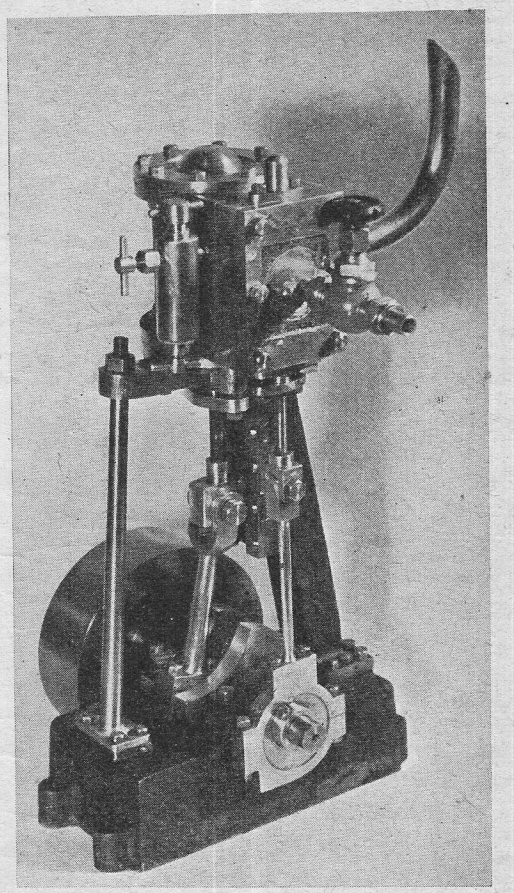
Alternatively, is the enamel "Sol," about which "L.B.S.C." has often written, yet on the market; also, concerning painting a locomotive boiler in colour, can anyone offer practical advice to supplement that already given by "L.B.S.C." for the use of "Sol"?

Yours faithfully,

Enfield. H. J. TURPIN.

A Vertical Engine

DEAR SIR,—The reproduced photograph is of a 1½-in. × 1½-in. vertical steam engine that I have just completed. Castings for this were purchased from Mr. O. Bolton, of Sydney; but, as all bolts, etc., could not be purchased, these were made.



I first got the model-making urge in about 1914, but only during the last two years have I had the necessary gear to carry this out after purchasing a small Myford lathe, and photograph shows results of my first effort.

Yours sincerely,

Bathurst, N.S.W. T. EVANS.

Ship Design

DEAR SIR,—I have studied with interest the photograph of the model of the *Queen Mary* on the cover of a recent issue of THE MODEL ENGINEER.

I am not an expert on ship modelling, but have always been interested in real ships of all sorts, from liners down to small yachts, and I have noticed a tendency among ship modellers, which is well illustrated in the photograph in question, to go wrong on the most important point in connection with a ship, viz.: the lines.

Far too often these are reproduced in model form merely as a rectangular box with bow and stern added. I am told by a naval architect friend that the lines of the *Queen Mary*, which was designed for speed, are not absolutely perfect, in that she is said to embody 100 feet of "parallel middle body," which adds nothing, or almost nothing, to her natural speed, which by Freud's law is the square-root of the water-line length in feet equals the "just" or "easily driven" speed in knots. This law apparently assumes a vessel to be "ship-shape," or of flowing lines, throughout her length.

But the model in question appears to have the equivalent of about 500 feet of parallel middle body at the water-line, which is the critical spot.

A miniature locomotive which is deliberately built as a replica of a prototype is rightly condemned if certain parts or lines are grossly untrue to the original.

To my mind, this holds even more weight when applied to ship models. This letter is not intended to be destructive, or to condemn the model referred to, which shows excellent detail work, but it is intended to draw attention to the desirability of building as nearly to the lines as is possible.

I know line drawings are in all cases difficult and in some cases impossible to obtain, particularly of large and important ships, but more observation of prototypes and photographs can do much to simulate the correct shape.

Modellers should, I think, study ship shapes and become as familiar as possible with bow and stern and middle body contours before embarking on the colossal labour of building a model. The results will justify the investigations.

Yours faithfully,

Byfleet. W. S. NORRIS.

A Locomotive Curio

DEAR SIR,—The locomotive illustrated on page 272 of the March 14th issue of THE MODEL ENGINEER is Springwells Colliery locomotive. Two were supplied by Robert Stephenson & Co. in 1826. The engine is shown running in the condition it was rebuilt by the Colliery Co. in their shops. They were scrapped about 1879. (See *A Century of Locomotive Building*, by J. G. H. Warren.) Also, a paper by E. A. Forward read to the Newcomen Society on the Springwell locomotives.

Stockton & Darlington No. 2 was *Hope*, practically identical with Nos. 1 and 3, *Locomotion* and *Black Diamond*.

Yours faithfully,

Hertford. G. WOODCOCK.

Clubs

The City of Bradford Society of Model and Experimental Engineers

On April 18th, Thursday evening, 7.30 p.m. at the Gladstone Club, Fitzgerald Street, Bradford, "Work in Progress" meeting. This is the fourth in the new series in which members who bring work are awarded points. The M.C. for the W.I.P. meetings is Mr. H. Shapcott ("Uncle Bob"). May 2nd, Thursday evening, same time and address. Mr. T. B. Rose, member, is the speaker for this evening, and his subject, "Bradford to Venice in a £15 car," the car being a 1926 Lagonda. May 16th, Thursday evening, same time and address. "Work in Progress," meeting number five.

Visitors to any of the above meetings will be cordially welcomed. Full particulars from: Hon. Secretary: W. WOOD, 274, Hunsworth Lane, Cleckheaton.

The Society of Model and Experimental Engineers

There will be a meeting at 39, Victoria Street, Westminster, S.W.1, on Saturday, April 13th, at 2.30 p.m., when a series of lecturettes will be given by members. These lecturettes are short talks on a variety of subjects likely to interest members.

The Lecture Hall is opened at this and all our Saturday meetings at 2 p.m.

Full particulars of the Society may be obtained from the Secretary, J. J. PACEY, 69, Chandos Avenue, Whetstone, N.20.

Ulster Society of Model Engineers

The next meeting of the above society will be held in the Café Val-Dor, Wellington Place, Belfast, at 7.45 p.m., on Monday, April 15th, 1946.

Subject: "Get together" night, followed by light refreshments.

Will all members please attend, as important business is to be discussed. Visitors will be welcome.

Hon. Secretary: E. C. MUNDAY, 10, Royal Avenue, Belfast.

I.W. Model Engineering Society

The Club's exhibition will be held at the County Secondary Grammar School, Newport, I.W., on 25th, 26th and 27th April.

Hon. Secretary: V. C. RICHARDS, 13, Chapel Street, Newport, I.W.

Stephenson Locomotive Society

At a meeting held jointly with the Permanent Way Institution, Scottish Section, at the Royal Technical College, Glasgow, on February 9th, Sir Malcolm Barclay Harvey, K.C.M.G., gave a most lucid and interesting paper entitled, "Some Aspects of the Railways of Australia." He stressed the geographical difficulties and great distances, the reasons that led the respective States to adopt different gauges, the present proposals to standardise the gauge.

Other papers presented at provincial centres have included: "The Southern Railway and Eastleigh," by Mr. R. Howard, at Leeds; "The

Locomotives of the Middle East," by Mr. G. Harrop, at Manchester.

At the March meeting in London, Mr. O. S. Nock, B.Sc., held a large audience of members enthralled by his informal lantern lecture, "Personal Wartime Footplate Experiences," covering various types of modern or rebuilt locomotives operating often under difficult conditions entailed by lack of maintenance as well as poor fuel. Various driving methods were discussed and instructive diagrams displayed on the screen with other fine slides.

Hon. Secretary: H. C. CASSERLEY, "Ravensbourne," Berkhamsted, Herts.

Hull and District Society of Model and Experimental Engineers

On March 14th, we had a very interesting talk, by Mr. Crowther, on "Diesel Engines." The speaker was obviously master of his subject and well able to get it across to the audience. The talk was illustrated by various demonstration pieces and created great enthusiasm amongst our members, especially when he told us that the heavy oil engine in its ultra-modern form is well within the range of model-makers.

Will all members please note the following dates:—

April 11th. Mr. W. J. Bassett-Lowkes' lecture on "The Progress of Transport by Water."

April 25th. Usual fortnightly meeting.

April 28th. Demonstration of Model Race Cars, by Messrs. Buck and Hopkinson, in the East Hull Barracks, at 10.30 a.m.

May 9th. Mr. E. T. Westbury will lecture on "The History and Development of Model Petrol Engines.

Hon. Secretary: F. V. INGRAM, Woodlea, Thorn Road, Hedon, E.Yorks.

Welling and District Model and Experimental Engineers Society

Fixtures for April, 1946, are:—Friday 12th, W. Dixon—Common metals used by the Model Engineer; Saturday 20th, E. D. Dixon—Design of a 3½-in. gauge Electric Locomotive; Friday, 26th, Club track discussion on Trial Section.

A very enjoyable private exhibition was held on Saturday, March 16th, to celebrate the Club's first year. Well over a 100 people attended, and exhibits included Mr. Patterson's accurate scale gauge "O" lay-out, a G.W.R. "King" (4-cyl.), and L.N.E. *Cock o' the North*, both nearing completion, several other chassis and a number of locomotives, boats and small exhibits. Chiefly owing to transport difficulties, a number of models could not be included.

Hon. Secretary: E. D. DIXON, 262, Sutherland Avenue, Welling, Kent.

Leicester Society of Model Engineers

The next meeting will be held in the Canteen at the Precision Engineering Works, Wellington Street, at 7 p.m., on Tuesday, April 16th. This will be a "Rummage Sale" night, an opportunity to dispose of "junk" that may be useful to other members. At the meeting held on March 19th, which was well attended, the Exhibition Committee gave its first report, and, whilst no decisions have been made, it is now almost certain that an exhibition will be held in the autumn.

Hon. Secretary: J. WALKER, 78, Waltham Avenue, Leicester.

Wallasey Society of Model and Experimental Engineers

The annual general meeting will be held on Tuesday, April 16th, at All Saints' Church Hall, Hose Side Road, Wallasey, at 8.0 p.m. All members are requested to be present.

On Tuesday, May 14th, a lecture will be given jointly by Mr. Bellis and Mr. Lee on "The Cathode Ray Oscillograph."

Good progress has been made with regard to membership, which is now nearing the 50 mark, and the enthusiasm of our members brings them from all parts of Merseyside.

Hon. Secretary: W. K. NICHOLAS, 12, Rose Mount Drive, Wallasey (Tel.: Wall. 5131).

Grimsby and District Model Engineers' Club

The above Club held its first post-war exhibition of models at the Club room recently.

The models displayed were a magnificent representation of locomotives, stationary and petrol engines, ships and other models. One particularly interesting display was of fancy wood turning in lignum vitae, staged by A. Whydell. Among those present were several prominent Grimsby motor engineers and members of the Hull Society of Model Engineers.

The Grimsby Club is open to new members, who should apply at the Club Workshop, Fletchers Yard, Wellowgate, on Wednesday evenings, or write to the Club Secretary, HUGH FITZPATRICK, 58, Wellowgate, Grimsby.

South London Model Engineering Society

The next meeting will be held on Sunday, April 21st, at 11 a.m., when Mr. T. Rowland will give a talk on "Marine Engines." This will take place at club headquarters, Kings College Sports Ground, Dog Kennel Hill, East Dulwich, S.E.

The Wednesday evening meeting at 7.30 p.m. will be Problem Night, and will be held on April 24th.

The first two track runs in aid of local charities will be held on April 23rd and May 4th. A most interesting series of visits have been arranged for the coming weeks, and all unattached model engineers in South London will be well advised to write for particulars of membership.

Hon. Secretary: W. R. COOK, 103, Engleheart Road, Catford, S.E.6.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects, which should be addressed to him at Cordwallis Works, Maidenhead, Berks. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall and Co. Ltd., 23, Great Queen Street, London, W.C.2.

Correspondence relating to display advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 23, Great Queen Street, London, W.C.2.

"THE MODEL ENGINEER"
SALES AND WANTS

Privat.: **Threepence** *word.* *Trade*: **Sixpence** *word.* *Use of Box 2/6 extra. Minimum charge, 3/-*

TOOLS & WORKSHOP

Buck and Ryan's Department for Lathes, Drilling Machines, Grinders, Electric Tools, Chucks, Surface Plates, Lathe Accessories and Tools.—310-312, Euston Road, London, N.W.1. Telephone: EUSton 4661. Hours of Business: 8.30 to 5.0 p.m., Monday to Friday; Saturday, 1.0 p.m.

Silver Steel Rounds, Squares, Asbestos Sheet, String, B.M. Steel Rounds, Squares, Angles, Flats, Brass Rounds, Squares, Flats, Hexagons, Sheets, Copper Tubes, Rounds, Squares, Sheets, Screws, Nuts, Drills, Taps, Dies, Rivets. S.A.E. for lists.—S. REED & SON, 89, Keresley Road, Coventry.

Split Chucks for Watchmakers Lathes, 6 mm., 6½ mm., and 8 mm., at 7s. each, postage 6d.—JOHN MORRIS, 64, Clerkenwell Road, London, E.C.1.

"Tool News" keeps you up-to-date. Specimen copy 6d., post free.—GARNERS, Sheffield Road, Barnsley.

Castings and Blue Prints for "Eureka" sawing, drilling and filing machines now available. Gear cutting and machining.—POYSER, Tool Maker, Peck's Hill, Mansfield.

Materials. Sheet, strip, rod, tube, etc., in ebonite, fibre, duralumin, gunmetal, brass, steel, etc., Screws, Nuts, etc. S.A.E. for list "M."—RETAIL MATERIAL SUPPLIES, 377, Milkwood Road, Herne Hill, London, S.E.24.

Hand Shaper, Adept, No. 2. Perfect condition, little used, £9 10s.—OAKERVEE, 92, Harvist Road, London, N.W.6.

Wanted, Woodturners Lathe and accessories, Scroll Saw, Bandsaw. Condition and price to—J. WILSON, 38, Berners Road, Felixstowe.

For Sale, 5-pint Paraffin Brazing Blowlamp, only used twice, £5. Wanted to buy, hire or borrow 32 D.P. Gear Cutters for 10, 20 and 40 tooth gears.—LANGER, The Warren, Brenchley, Kent. Tel. Brenchley 42.

All at Bargain Prices. Sale Workshop Surplus. Wide variety unused H.S.S. Slitting Saws, Shell Mills, Angle Cutters, S.F. Cutters, End Mills, Cylindrical Cutters, Dovetail Cutters, etc. All subject buyers approval on delivery. Satisfaction or money returned. Send S.A.E. full list bargains.—Box No. 3961, MODEL ENGINEER Offices.

End Mills, ⅛", 5/32", 3/16", ¼", 1s. 3d. each; 5/16", ⅜", 7/16", ½", 1s. 9d. each, post 3d.—80, Ridgeview Road, London, N.20.

Motorised, Five Speed Bench Drills, 230-250/1/50, £32 10s.; Double Ended Electric Bench Grinders, 6" diameter Wheels, £12; 8" ditto, £18 13s. 6d.; Wolf Heavy Duty 0-⅜" Portable Electric Drills, £10; one only second-hand consolidated 0-⅜" Portable Drill, very good condition, £10 17s. 6d. Carriage extra.—CORBETTS (LATHES), Stanton Hill, Mansfield. Telephone 583, Sutton-in-Ashfield.

Wanted, 3½" or 4" Drummond or Myford Lathe, with accessories. Write details.—BAILEY, 32, Oakfield Road, Bristol 8.

Wanted, Aerograph foot operated spraying outfit; also DeVilbiss type G.P. Spraygun.—11, Farmcombe Close, Tunbridge Wells.

Wanted, Poole Special or Major Lathe.—COLLINS, 4, Rosecroft Gardens, Dollis Hill, N.W.2.

Wanted, 3½" or 4" B.G.S.C. Lathe.—MORGAN, "Arosfa," Baglan, Port Talbot, Glam.

4s. 9d. Any Lot. Five Lots, 22s. 6d.

One Doz. Twist Drills, Standard Jobbers, Mixed High Speed and Carbon, 1/16" to 3/16"; 18 Drills, 1/32" to 1/16"; 8 Drills, ⅛" to ¼"; 10 Carb. and Emery Wheels, 2" to 4" diameter, 1/16" to ¾" thick, ⅜" hole; ⅝" Square Shank Toolholder with tool steel to make 12 turning tools; three high speed Tap or Reamer Fluting Cutters; 1¼" diameter; ⅝" hole; ⅛" to ¼" thick; three high speed Slitting Saws, 1" diameter; ⅜" hole; three H.S. Clock Gear Type Cutters, ⅛" diameter, ⅜" hole; one Carb. Polishing Belt, 30 ft. long, 4" wide; 10 assorted Files, 4" to 6"; eight left-hand Taps to ½" diameter; six Fine Thread Taps, Instrument Thread, to ⅜" diameter. All brand new.—BURKE—Below.

2,000 Toolmakers Needle Files, assorted shapes, 9s. per doz.; 4s. 9d. half doz.—BURKE—Below.

5,000 Circular Split Dies, 13/16" diameter, cutting 0, 1, 2, 3, 4, 5, 6 B.A. threads, 8s. 9d. per set; Taps to suit seven sizes, 5s.; also Dies Cutting ⅛", 5/32", 3/16", 7/32", ¼", Whitworth, 6s. 3d. per set of five; Taps to suit, 3s. 9d. set; either tapers, seconds or plugs any thread.—BURKE—Below.

2,000 Small Taps, 7 to 12 B.A.; also 1/16", 3/32" Whit., 12s. doz.; 6s. 6d. half doz.—BURKE—Below.

3,000 Hexagon Die-Nuts, ¼", 5/16", ⅜", 7/16", ½", Whit., B.S.F., or American. S.A.E. Car Thread, 12s. 6d. set of five; three sets, 33s. 6d.; Taps to suit, 6s. set of five; three sets, 16s. 6d.—BURKE—Below.

4,000 High Speed Countersinks and Counterbores, with detachable pilots, diameter of cutters, ⅜" to ¾", brand new, best American make, Ex Aircraft Stores, actual value, 15s. to 25s. each. An absolute gift. Six assorted, £1; one doz., 37s. 6d.—BURKE—Below.

800 High Speed Radius and Angle Type forming Milling Cutters, 2½" to 4" diameter, 1" hole, brand new, given away, 14 lb. weight, assorted our selection, 70s.—BURKE—Below.

500 H.S. Angle and Straight Type End Mills, Reamers, Countersinks, ⅜" to 1½" diameter, six assorted, 30s., our selection, all brand new. One cutter cost more.—BURKE—Below.

2,000 H.S. Reamers, End Mills, Solid Pilot Counterbores, brand new, ¼" to ¾" diameter, six assorted, our selection, 12s. 6d.; doz. assorted, 22s. 6d. —BURKE—Below.

600 Tungsten Carbide Tipped Tools, Shanks ¾" square, also ¾" by 1", worth 12s. to 20s. each, another gift, five assorted, £1, brand new.—BURKE—Below.

Prompt delivery, subject unsold. £1 orders post paid. Inspection at our Sheffield Warehouse by appointment.—J. BURKE, 41, Sunnyvale Road, Sheffield.

£30 Micrometers, Height Gauge, Clock, Verniers, Callipers, V-blocks, Parallels, etc., large Oak Cabinet. S.A.E. particulars.—32, Northway, Maghull.

The "Newblo" Plane Iron Sharpening Device for honing correct cutting angle. Price 3s. 6d., post free. L. Newcombe, Colwich, Nr. Stafford.

Adept Accessories in Stock. Replacement and repair service. Special accessories to order.—BARDWELL, 473, Abbeydale Road, Sheffield.

Bench, Steel, Timber top, 54" × 22", fitted 60" overhead shaft, 90s.—EMBerbrook 2750.

Sale, 3" Lever Chuck, 2 sets jaws (3-jaw), £1.—28, Beverley St., Derby.

Sale, 2" Wade Lathe, complete with two chucks, faceplate, centres, driver, tools, and electric motor. Offers to—BM/TFWR, London.

For Sale, Drummond Shaper, good condition, little used, auto feed, complete. Best offer over £20.—BROWN, 14, Stoke Road, Gosport.

For Sale. In perfect condition, Myford 3½" ML4 tumbler reverse. New pattern tailstock, ½ h.p. motorised, V belt throughout, chucks, vertical slide, tools, etc. First 50 Pounds secures, carriage paid destination. No offers.—Box No. 3964, MODEL ENGINEER Offices.

Wanted, Two Lathes, 4" to 6", back geared, screw cutting immaterial. Price and particulars to—LONEY, Uphill, Broom Barn, Nr. Stevenage, Herts.

Myford ML7 Lathes, 3½" centres (as described and illustrated in this journal 21/2/46). Production will commence within the next 6 months, and we are now able to accept orders. No prices have been fixed.—TERRY's, Fishers Lane, Cold Ash, Newbury.

Wanted, Urgently, Super Adept Lathe and accessories; For Sale, 3 Octave Xylophone Resonators, 3 pair Beaters, stand and carrying case, £15.—R. CHAPMAN, "Windsor House," 58, Sandford Road, Chelmsford, Essex.

Multi-speed ½" "Impetus," motorised, 230/1/50, Sensitive Drill, Jacob's Chuck, new, £13 10s.—9, Upper Coltbridge Terrace, Edinburgh 12. 'Phone 61722.

For Sale 5" S.C.B.G. Lathe and countershaft, 2' 6" between centres, £18.—"ADVERTISER," "Beech House," 37, Wilmslow Road, Handforth, Cheshire

Lathe, 3½" Drummond, motorised, V Belts, Chucks, stand, treadle, £40.—HAL, 164, Osidge Lane, N.14.

Myford 3⅜" B.G.S.C. Lathe for sale, complete with motor, all on iron stand, built in C.S. and Emery Grinder. Offers to—EKINS, Kirkgate Street, Wisbech.

Wanted, 3½" or 3¼" B.G.S.C. Lathe, with or without treadle. Price and particulars.—GLOVER, Audlem Road, Nantwich.

Vernier Caliper 12" For Sale, 1/1000", 1/100 cm. Brand new in case, £5 10s.—29, Trentvale Road, Beeston, Notts.

MODELS & FITTINGS

Apex and New Atom Minor (Mr. Westbury's design). Engine castings in our latest attractive finish now ready. Carburettor castings (described June 14th issue MODEL ENGINEER), and spiral timing gears for Apex, ball-races, piston rings, miniature plugs, contacts and other requirements. Send us your enquiries. Trade also invited.—THE HEADINGLEY MOTOR & ENGINEERING CO. LTD., 8, Otley Road, Leeds.

"Featherweight" Guaranteed Coils, 1½ oz., 25s.; 1 oz., 37s. 6d. Trade enquiries invited.—THE MODEL STORES, 26-27-28, The Extension, Shepherds Bush Market, London, W.12.

Australian Models. Australian Locomotive and Engine Designs, also Castings, Catalogue, 2s.—BOLTON, 70, King Street, Sydney.

David Curwen, Experimental Engineers, Gore Lane, Bardon, Nr. Marlborough, Wilts. Light power steam engines of all types.

Now in Stock, 9/16" bore lightweight Super Marine Engines, £3 10s.; 5/16" bore high pressure Oscillating Engines, £1 10s.; 16-gauge copper boilers, ends and seatings, spun in 2⅛" × 5½", 19s. 6d. + 2s. 6d. per inch on length. Safety valves, steam cocks, steam taps, water gauges, 4s. 6d.; seating, 8d.; union nuts, 8d.; in production, Twin cylinder Oscillating Engines, £2 2s.; Fuel Burners, complete with regulators, 11s. 6d.—TONBRIDGE INSTRUMENTS, 13, Quarry Hill Parade, Tonbridge, Kent.

Majesco "45" Miniature Aero-Motor (4.5 c.c.), die castings; all materials; detailed instructions; working drawings. Complete kit, 36s. (post paid).—MAJESCO MINIATURE MOTORS, 35, St. Flora's Road, Littlehampton, Sussex.

Centrifugal Pump, 180 gallons per hr., set of castings with drawings, 7s. 6d., plus postage.—AIRCRAFT SPARES & REPAIRS LTD., 37, Springfield Road, Shepshed, Leics.

"Princess Marina," 3½" gauge, wanted, to "L.B.S.C." specification, stand inspection, chassis or nearly complete considered. Full particulars.—SMITHS, 75, Newcastle Road, Shelton, Stoke-an-Trent.

Wanted, Model Steam Engine, 1" × 1", boiler fittings complete. Price particulars.—J. MYERS, 26, The Drive, Cross Gates, Leeds.

6-c.c. and 5-c.c. Engine Castings, Crankshaft Rotary Valve, 5,300 r.p.m., 13" propeller, approx. 6½ ozs., castings, blueprints, and machined crankshaft, 21s.; machined parts for above supplied from stock. Small number of bare engines ready (tested) to first remitters, £4 5s.; 10-c.c. Engines and Castings ready shortly. Immediate replies guaranteed S.A.E. Manufactured by—E. REEVES, Model and Precision Engineers, Works, Church Street, Shifnal, Shropshire.

Wanted, a 3½" gauge Steam Locomotive.—DONALD SAMUELS, 36, Park Lane, Old Park, Oakengates, Shropshire.

For Disposal, Several fine Steam Model Locomotives and Fire Engine. Bargain to clear the lot or exchange Stamp Collection.—21, Commonside, Keston, Kent.

Boiler Building and Brazing Service. Quotation given against drawing. Cylinders machined, wheels turned, valve gear parts made to order. Stamped addressed envelope with all enquiries. Easyflow, B.A. Screws in stock.—WEMBLEY MODELS, 6, Park Road, Wembley.

Sale, 12 3½" Drummond Change Wheels, sound, 28s.; wanted urgently, "English Mechanics," describing "Eva May."—12, Howard Street, Connahs Quay, near Chester.

Wanted, Locomotive, 3½" or 5" Gauge. Any type. Willing to consider unfinished job, £15-60.—Box No. 3963, MODEL ENGINEER Offices.

30-c.c. Engine, Air-cooled, Ball-bearing, domed head, O.H. valves, coil, new, £15 offers.—88, Langleys Road, Selby Oak.

For Sale, Mill Engine, complete with boiler and 4 V. dynamo. Nearest £9. Can be seen working. Buyer collects.—F. BARTLETT, 2, Claremont Avenue, Sunbury-on-Thames, Middlesex.

Racing Hydroplane Transmission (Shaft, Tube, Skeg and Propeller) as used on a British record breaker; Flywheels with starting groove, 6-c.c., 9-c.c., 15 c.c., coupling nuts for engine shafts; propellers, stern tube and skeg for speedboats, 4.5-c.c. to 9-c.c.—"B.M. MODELS," 43, Westover Road, Bournemouth.

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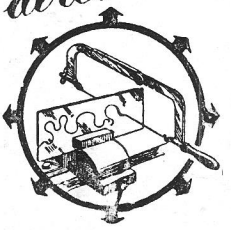

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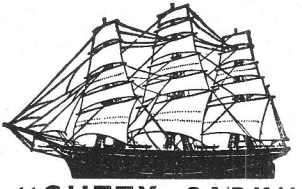

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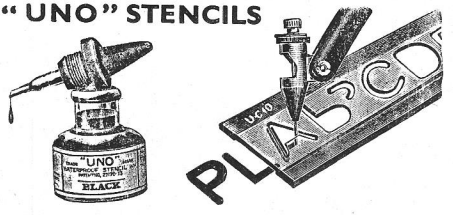

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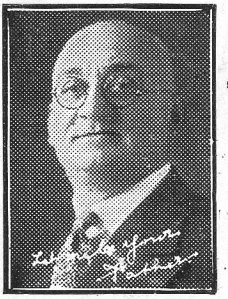

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